The Origins and Development of South African Energy Policy

Andrew Marquard

Thesis Presented for the Degree of

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the Faculty of Engineering and the Built Environment

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"Audiences know what to expect, and that is all they are prepared to believe in."

The Actor, in *Rosenkrantz and Guildenstern – are Dead*, Tom Stoppard

I, Andrew Marquard, hereby declare that the above thesis is my own unaided work, both in concept and execution, and that apart from the normal guidance from my supervisor, I have received no assistance. Neither the substance nor any part of the above thesis has been submitted in the past, or is being, or is to be submitted for a degree at this University or at any other university. except as stated below.

Signature: Signed by candidate

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Abstract

What are the main features of the development of South African energy policy, what were the factors which determined policy outcomes, and what is its potential for the future? The study below uses a combination of three theoretical approaches (networks, multiple streams, and institutional/organisational theory) to approach these questions, combined with a model of energy policy development to situate the development of South African energy policy and its associated institutions in a broader context. The model is useful both as a way of classifying and comparing various energy policy regimes, and also because it has some predictive power: it associates certain energy policy 'paradigms' with certain policy capabilities.

Following a review of the theoretical frameworks and an outline of the model, the study recounts a detailed history of the four main areas of energy policy activity, namely coal policy, electricity policy, nuclear policy and liquid fuels policy, followed by an account of the development of energy policy activity and institutions in government, and an analysis of the main policy and institutional developments in each case. A variety of sources were used, including official documents, interviews, media reports and secondary sources.

The outcome of the study was that the development of energy policy in South Africa was significantly influenced by two factors: apartheid, and the structure of the South African energy system. Although there are a number of significant discontinuities between apartheid-era and post-apartheid energy policy, notably in the social and institutional dimensions, there are other underlying continuities which are more deeply related to the structure of the South African energy system, and which contribute to the frustration of current energy policy initiatives. Thus, in order to tackle problems such as energy poverty and global warming successfully, future energy policymakers will have to consider measures which address the structure of the energy system itself, as predicted by the model.

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Abbreviations and Units of Measure

AA	Automobile Association
ACDS	Approved Coal Distributors' Scheme
ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie (Agency for the Environment and Energy Management)
AEB	Atomic Energy Board
AEC	Atomic Energy Corporation
AHI	Afrikaanse Handelsinstituut
Amcoal	Anglo American Coal Corporation Limited, formed 1975
AMEU	Association of Municipal Electricity Undertakings
ANC	African National Congress
APA	Anthracite Producers' Association
Armscor	Armaments Corporation of South Africa
BEE	Black Economic Empowerment
BEVA	Brandstof Element Vervaardigings Aanleg (Fuel Fabrication Enterprise)
BLA	Black Local Authority
BTI	Board of Trade and Industries
BWR	Boiling Water Reactor
CAB	Coal Advisory Board
CAC	Coal Advisory Committee
CAC	Coal Allocation Committee
Calref	coastal refinery (Cape Town) owned by Caltex
CANDU	Canada Deuterium Uranium reactor
CBD	Central Business District
CDA	Combined Development Agency
CDF	Capital Development Fund
CEF	Central Energy Fund
CGU	Central Generating Undertaking (in Escom)
CNS	Council for Nuclear Safety
Codesa	Convention for a Democratic South Africa
COSATU	Congress of South African Trade Unions?
CRAET	Centre for Research into Appropriate Energy Technology
CSIR	Council for Scientific and Industrial Research
DACST	Department of Arts, Culture, Science and Technology

DME	Department of Minerals and Energy (1997 on)
DMEA	Department of Mineral and Energy Affairs (before 1997)
DSM	Demand-Side Management
ECB	Electricity Control Board
EdF	Eletricité de France
EDI	Electricity Distribution Industry
EDP	Economic Development Programme
EDRC	Energy and/for Development Research Centre
Enref	coastal refinery (Durban) owned by Vacuum Oil, then Mobil, then Engen
EPC	Energy Policy Committee
EPRET	Energy Policy Research and Training Project
ERC	Energy Research Centre
ERI	Energy Research Institute
ERIC	Electricity Restructuring Interdepartmental Committee
Escom	Electricity Supply Commission
ESI	Electricity Supply Industry
Eskom	post 1987 name for Escom (not an acronym)
EUU	Energy Utilisation Unit (predecessor to the ERI)
EWG	Electricity Working Group
FOB	Free On Board
FOR	Free on Rail
FRI	Fuel Research Institute
GDP	Gross Domestic Product
GNU	Government of National Unity
HEU	Highly Enriched Uranium
HFO	Heavy Fuel Oil
IAEA	International Atomic Energy Agency
IBLC	In-Bond Landed Cost
IDC	Industrial Development Corporation
IEA	International Energy Agency
IES	Institute for Energy Studies
IP	Illuminating Paraffin
ISASA	Isotope Separation Association of South Africa
Iscor	Iron and Steel Corporation
JPAC	Joint Petrol Advisory Committees

LFITF	Liquid Fuels Industry Task Force
LPG	Liquid Petroleum Gas
MB	Minerals Bureau
MEC	Minerals-Energy Complex
MEG	Minerals and Energy Group
MEPC	Minerals and Energy Policy Centre
MERG	Macro-Economic Research Group
MIF	Motor Industries Federation
MLIS	Molecular Laser Isotope Separation
Mossgas	synthetic fuel plant in Mossel Bay using natural gas feedstock, now owned by PetroSA
MPAR	Marketing of Petroleum Activities Return
MPC	Minerals Policy Committee
MTA	Motor Traders' Association
NAC	Natal Associated Collieries
Natref	inland refinery (Sasolburg) owed by Sasol and Total
NCER	National Committee for Energy Research
NEC	National Energy Council
NECSA	Nuclear Energy Corporation of South Africa
NEDLAC	National Economic Development and Labour Council
NEDO	National Economic Development Office (UK)
NEF	National Economic Forum
NELF	National Electrification Forum
NEPAD	New Partnership for Africa's Development
NER	National Electricity Regulator
NFCI	Nuclear Fuel Cycle Initiative
NP	National Party
NPER	National Programme for Energy Research
NPT	Non-Proliferation Treaty
NRDC	Natural Resources Development Council
Nucor	Nuclear Development Corporation
Nufcor	Nuclear Fuels Corporation
OAPEC	Organisation of the Arab Petroleum Exporting Countries
OAU	Organisation of African Unity
OECD	Organisation for Economic Co-operation and Development

OPE	Office of Public Enterprise
OPEC	Organisation of the Petroleum Exporting Countries
PAC	Planning Advisory Council
PAR	Petroleum Activities Return
PBMR	Pebble Bed Modular Reactor
Petronet	State-owned petroleum pipelines company
PNE	Peaceful Nuclear Explosives
PPC	Parliamentary Portfolio Committee
PWR	Pressurised Water Reactor
Ratplan	Rationalisation Plan
RAU	Rand Afrikaans University
RDP	Reconstruction and Development Programme
RED	Regional Electricity Distributor
SAAU	South Africa Agricultural Union
SACOB	South African Chamber of Business
SAIEE	South African Institute of Electrical Engineers
SAPIA	6/11 South African Petroleum Industry Association
Sapref	6/4 coastal refinery (Durban) owned by BP and Shell
SAR & H	South African Railways and Harbours
Sasol	synthetic fuels and chemical corporation (formerly state-owned, now privatised)
SATMAR	South African Torbanite Mining and Refining Company
SEPC	Social and Economic Planning Commission
SFF	Strategic Fuel Fund
Soekor	state-owned oil and gas exploration company, now part of PetroSA
SOF	State Oil Fund
Spoornet	state-owned rail company
SRB	Shipping Research Bureau (Netherlands)
SSF	Sasol Synthetic Fuels
SWAWEK	Suid-Wes Afrika Water en Elektrisiteitskorporasie (South West Africa Water and Electricity Corporation)
TBVC	Transkei, Bophutatswana, Venda, Ciskei (four 'states' granted 'independence' during the apartheid era)
TCOA	Transvaal Coal Owners' Association
TEC	Transitional Executive Council
TNC	Tans Natal Coal Corporation

Transnet	post 1980s name for SAR & H
Ucor	Uranium Enrichment Corporation
UCT	University of Cape Town
UNDP	United Nations Development Programme
UROTA	Unlawful Restraint of Trade Act
VFTPC	Victoria Falls and Transvaal Power Company
VLCC	Very Large Crude Carrier

Units of Measure

kgSWU	kilogram Separative Work Unit; a complex unit which expresses the amount of effort, given plant conditions, required to enrich a given quantity of natural uranium to a specified degree
J	joule; measure of energy
W	watt; measure of power, = 1 joule of energy applied for one second
Wh	watt-hour, measure of (usually) electrical energy, = 3600 joules
bbl	barrel, =159 litres, commonly used to measure volumes of crude oil
bbl/sd	barrels per stream day; amount of crude oil a refinery is capable of processing running at full capacity, per day
bbl/day	barrels per day, or barrels per calendar day; measure either of crude oil production (former) or of the *average* throughput of a refinery per day, taking into account factors such as maintenance shut-downs, and therefore less than bbl/sd
dwt	deadweight tons; measure of the mass a ship is capable of carrying, measured in imperial tons (0.9842 of a metric ton)
tce	tons coal equivalent; measure of energy expressed in terms of the energy content of an average ton of coal (29.3 GJ or 0.7 toe)
toe	tons oil equivalent; measure of energy expressed in terms of the energy content of an average ton of oil (42 GJ or 1.43 tce)

Magnitude Prefixes

k	kilo, 1000 (10^3)
M	mega, 1 000 000 (10^6)
G	giga,1 000 000 000 (10^9)
T	tera, 1 000 000 000 000 (10^{12})
P	peta, 1 000 000 000 000 000 (10^{15})

Organisational Affiliation of Interviewees

During the course of research for this study, many people currently and formerly involved in energy policymaking in South Africa were interviewed, mostly to elucidate periods where the written record is not reliable or does not exist. These were supplemented by many informal conversations with a range of very helpful people involved in, or previously involved in, the energy policy environment. Of those interviewees referred to in the text, most have been mentioned by name, with the exception of those from the oil industry, in which cases their organisational positions have been given in place of their names. In order to avoid repeating the organisational affiliations of interviewees (which also change in many instances) many times in the text, these are given below for named interviewees, for ease of reference.

Basson, J – energy researcher at the NPER in the 1980s; energy researcher/official in the NEC in the late 1980s/early 1990s; head of the DMEA's Energy Chief Directorate from the early 1990s to the late 1990s

Burger, T – energy planner in the Department of Planning in the 1970s, DMEA/NEC in the 1980s; senior liquid fuels policy official in the DMEA in the 1990s

Eberhard, A – energy researcher in the ERI in the 1980s; founding director of the EDRC in the late 1980s/1990s and EDRC policy activist (see Chapter 7); board member of the NER in the late 1990s

Grant, W – senior nuclear engineer in the AEB/Ucor/AEC from the 1960s to the 1990s; General Manager of Ucor in the 1970s; technical leader of both the nuclear establishment's enrichment and reactor research programmes

Jackson, A – senior nuclear engineer in the enrichment programme in the AEB/Ucor/AEC from the 1960s to the 1990s

Kotzé, D – head of the Department of Planning's energy section in the 1970s; head of the IES in the 1980s/1990s

Lambrechts, I – finance expert drafted into the BTI inquiry into the electricity industry in the late 1970s; member of the ECB in the late 1970s to 1990s; member of the Electricity Council from the 1980s to the 1990s; board member of the NER in the mid-1990s

McRae, I – Escom engineer before the 1970s; head of the CGU in the 1970s; Eskom CEO in the late 1980s and early 1990s; founding CEO of the NER in the mid-1990s

Morgan, A – Escom engineer before the 1980s; senior manager in Eskom distribution in the late 1980s; Eskom CEO from the mid-1990s to the 2000s

Neethling, D – founding director of the Minerals Bureau in the mid to late 1970s; head of the DMEA's Energy Branch in the early to mid 1980s; head of the NEC from the late 1980s to early 1990s

Pickering, M – Eskom engineer in the early 1990s; EDRC policy activist in the early to mid-1990s

Roberts, H – senior CEF official from the mid-1980s to mid-1990s; acting head of CEF in the late 1990s

Stumpf, W – senior nuclear engineer in the AEB/AEC from the late 1970s to the late 1980s; CEO of the AEC from the late 1980s to the late 1990s

Van Den Berg, S – official in the Department of Commerce in the 1960s; senior official in the Department of Commerce/DMEA responsible for liquid fuels in the 1970s and early 1980s; chief liquid fuels policy official in the NEC/DMEA in the late 1980s/early 1990s

Van Horen, C – EDRC policy activist in the early to mid-1990s

Introduction

Exploring, and attempting to explain, the origins and development of South African energy policy can take a number of different routes. Contrary to the ordinary use of the term 'energy policy' by analysts and practitioners, a historical review such as the one undertaken below gives rise to significant complications, given the changes in the way in which 'energy policy' has been defined or understood in different periods, in South Africa and elsewhere. The concept of 'energy' is relatively new, dating back only to the mid-19th century in physics, and the concept of 'energy policy' is even more recent, as is its associated 'energy policy vocabulary' (concepts such as 'energy planning', 'energy balance' or even 'energy demand').

The concept of 'energy policy' first appeared in the latter half of the 20th century in industrialised countries, and was centred around the concept of the 'energy sector', a new way of organising our thinking about these industries, their development, and most importantly, the connection between them. Previously, governments had been concerned to various degrees with the supply and production of wood, coal, electricity and petroleum; the birth of energy policy heralded not only a new project[1] of government involvement in the sub-sectors and related components of the energy sector *per se*, but a new conceptual basis for government involvement in society and the economy, based on the introduction of an unfamiliar quantitative measure (Joules) into public policy processes: whereas previously the *cost* and the *volume* or *mass* of each energy carrier were the only quantities of significance to policy makers, the *energy content* now became significant to decision-makers.

Energy policy denoted a new area of activity for government, which not only linked previously separate sets of activities, but rapidly led to new patterns of research, regulation, planning and investment. The energy crisis, various environmental crises, and new perspectives on energy-development issues outside the OECD led to new concepts such as the energy system, and demand-driven energy policy based on 'energy services' in addition to or as an alternative to the supply-based concepts of the industrial energy sector, including non-commercial energy production, transactions and use. The concept of the 'energy system', a representation of the

[1] The sense in which the concept 'project' has been used in this context has been borrowed from critical theorists such as Jürgen Habermas (for instance, Habermas 1997). Habermas and others use the concept to denote a coherent and deliberate historical undertaking usually involving many actors, which is elaborated in conceptual and concrete terms by each generation of actors. In this sense, although historical projects have a definite historical starting point, they are always provisional and never 'completed', but instead modified, redefined or abandoned by the next generation of participants. This use of the term captures the evolution of energy policy well, and emphasises its historical origins as well as its mutability.

flows of commercial and non-commercial usable energy in relation to societal activities (including the energy sector), formed an expanded basis for energy policy, particularly for developing countries. The concept of 'energy services' (services associated with energy provision, but partially or completely substitutable by other non-energy-supply measures, such as building insulation or spatial planning), is not easily encapsulated even by the concept of the energy system, even though it is a key concept in some countries' energy policies.

Different linkages to issues such as nuclear weapons proliferation, the geopolitics of the Middle East, deforestation and health issues in poor communities, various forms of globalisation, pollution and other environmental issues, define the scope of the project differently in different national and international contexts, and involve a complex of issues not conceptually unified by either the concepts of the energy sector or the energy system. Technical developments, both in physical technology in the energy system as well as in areas such as economic regulation and financial and equity markets, developed the scope of potential government involvement in areas of society not defined by the formal boundaries of the energy sector. In addition, current challenges in energy policy broadly grouped under the problem of sustainability, encompassing social, environmental and economic problems, are proving the most complex addressed so far, and solutions will probably demand a radical reassessment of the scope and nature of energy policy, or possibly the abandonment of the energy policy project altogether, and its replacement with a more ambitious policy paradigm embracing a more complex set of social and institutional relations.

This rapid development over a period of only decades poses certain problems of method in undertaking a historical analysis of this kind, and there are three possible approaches. The first can be termed an *analytical* approach, which delineates energy policy in terms of government involvement with a specific subset of the social and/or economic system such as the energy sector, and considers all policy activities defined in this way as 'energy policy'. Thus, electricity policy or coal policy can be considered 'energy policy'. The advantages of this approach are conceptual simplicity and critical rigour, particularly for the evaluation of specific policies, but it obviously risks historical anachronism, as well as being unable to offer a satisfactory account of institutional change.

A second approach can be termed a *historical* approach, which starts from the opposite basis, specifically a study of policy activities delineated by state participants as 'energy policy'. In this case, energy policy in South Africa only makes an appearance at the end of the 1960s, and its scope undergoes significant changes during the subsequent decades. A clear distinction is drawn between related categories of policy, such as electricity or coal policy, which have a much longer history, and energy policy. Emphasis is on the *activity* related to a historical delineation of

'energy policy', rather than on an analytically-defined *domain* of society or the economy, and its governance. Its most significant advantage over the analytical approach is that it provides a perspective on the emergence and evolution of new *defining concepts* such as 'energy services', which establish the potential scope and form of energy policies in a particular milieu. At the same time, the critical value of this approach is blunted by its inability to distinguish between energy policy-related conceptual innovations and largely contingent definitions of the energy policy domain (for instance, the classification of nuclear non-proliferation as an energy policy issue rather than a defence issue), as well as by its inability to separate the *intent* of policy and institutional changes from their *execution*.

I will thus propose a third approach, a *critical-historical* approach, which attempts to add to the historical approach a degree of critical reflection on historical practice in relation to an evolving normative framework for energy policy activity. The *critical-historical* approach involves conceiving 'energy policy' as a *historical project*; a specific pattern of governmental activity beginning at a specific historical point and taking a specific institutional form. Defining energy policy as a historical project and a type of governmental activity provides a broad scope to understand its establishment and development not afforded by an exclusively analytical or historical definition. A specific energy policy project, rooted in a particular context, has specific aims which develop with the project itself. These can be evaluated against an abstract model for the development of energy policy per se; each phase of this development has slightly different aims and potentialities, and there is thus a correlation between specific phases of the abstract model and various kinds of policy challenge, such as energy poverty or global warming.

The central feature of almost all energy policy projects is their evolution in what the policy theorist Aaron Wildavsky termed a 'dense policy space' (Wildavsky 1979:64-66), populated by existing policy systems which incorporated energy supply industries into their domains, such as economic policy, industrial development policy, or minerals policy; thus, these industries and their corresponding markets were regulated or planned within these policy domains. Initially, these functions were partially or completely reorganised on a new basis, with the aim of achieving a higher degree of co-ordination, co-operation and integration between different energy-related policy spheres. Overlaying this process was a set of novel activities, the function of which was to collate and process relevant data on energy flows, usually in the context of some form of planning processes, as well as a process of conceptual and institutional innovation. These processes (of both integration and innovation) can be categorised into a series of *energy policy paradigms*, which each involve not only a different conceptual outlook, but also a different scope of intervention, and a corresponding set of institutional arrangements. It will be argued below that there is a relationship between the structure and politics of the energy system

and its pre-existing institutions, and the success or failure of attempts to establish an energy policy capacity, and to progress from one paradigm to another.

It will also be argued that these problems have been particularly acute in the South African case. The development of South African energy policy has some peculiar features: it developed far later than in other industrialised countries, and suffered from a perpetually weak institutional basis, which was only remedied to a limited extent by the end of apartheid. The structure of South Africa's energy system (with its overwhelming dependence on domestic coal) differentiated it from those of other countries; South Africa did not make the transition to oil undergone by other countries in the 1950s and 1960s. As a result, the conditions which prompted the development of energy policy in other industrialised countries were lacking in South Africa; however, the apartheid-related oil embargo added another dimension to energy supply crises experienced by other countries in the 1970s. Nascent interest in energy policy from the political elite in the late 1960s and early 1970s developed into an acute concern as the result of a series of energy policy-related crises in 1973, 1979, the mid-1980s, and during the political transition[2] (from 1993 to 1994). Institutional innovations resulted from these crises in establishing new areas of energy policy activity, but the structure of energy-related policy communities resulted in only partial success in achieving higher levels of integration, co-operation and co-ordination between energy-related centres of policy activity. These problems were exacerbated by certain features of the apartheid state: energy policy was conducted in an atmosphere of secrecy in which the energy sector was accorded a strategic status, and the energy needs of the majority of the population were ignored. The transition from apartheid solved some of these problems, but others remain.

The study below has three related goals. The first, in the almost complete absence of any secondary literature on the history and development of South African energy policy, is to provide a historical account. This has been hindered by a lack of historical data, which is partly a result of a lack of institutional memory in the form of written records, from both government and the private sector, and partly an enduring legacy of the extreme culture (and legal regime) of secrecy which enveloped much of the energy sector in the 1970s and 1980s. In addition to this, the lack of disaggregated data on energy production and use is partly a symptom of the weaknesses in the energy policy agencies of government itself during this period: historical energy data is thus potentially unreliable, and provides only a broad indication of trends in the country's energy

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[2] 'Political transition' refers to the transition from apartheid to post-apartheid, which involved two elements: *negotiation* (1991-1994) between the apartheid government and the anti-apartheid opposition, mainly (but not solely) represented by the African National Congress, which led to the adoption of an interim constitution specifying the parameters for the first post-apartheid *election* (1994), which led to the ANC taking power in 1994. Transitional processes, however, stretched considerably beyond the election in many areas of national life. From this point on, the transitional period and associated events will be referred to simply as 'the transition'.

system. The aim of developing a historical narrative is also a motivation for the level of detail below, which may otherwise not always be justified by its function in supporting the key arguments of the thesis.

The second goal is to trace and explain the development of energy policy in South Africa, and to place this within an international context, and the third goal is to provide some critical reflection on the relationship between the institutional capabilities associated with specific energy policy paradigms and specific energy policy challenges.

The theoretical framework for the study, discussed in Chapter 1, considers three complementary approaches to understanding and explaining the development of South African energy policy. The first draws on structural theories of the policy environment, particularly those dealing with policy networks and policy spaces. The second is concerned with the extent of broader political influence on policy processes, and the third with institutional and organisational influences. Chapter 2 outlines the international context regarding the development of energy policy, and a conceptual framework for categorising energy policy paradigms, as well as provide an overview of the development of the South African energy system as a context for the development of energy policy. Chapters 3 to 6 provide in-depth accounts of the development of key areas of energy-related policy, and Chapter 7 provides a detailed account of the development of energy policy institutions within the South African state. A final conclusion will synthesise these historical accounts with the explanatory framework outlined in Chapters 1 and 2.

Chapter 1

Theoretical Frameworks

> "It is the business of philosophy, not to resolve a contradiction by means of a mathematical or logico-mathematical discovery, but to make it possible for us to get a clear view of the state of mathematics that troubles us: the state of affairs *before* the contradiction is resolved.. ..The confusions which occupy us arise when language is like an engine idling, not when it is doing work." (Wittgenstein, Philosophical Investigations, points 125, 132)

Introduction

In his introduction to a recent collection of review articles titled *Theories of the Policy Process*, Paul Sabatier observes that the policy process "involves an extremely complex set of interacting elements over time" (Sabatier 1999:3). Since academic study of the policy process began with Lasswell (1951), a great deal of research on the policy process has provided a more detailed picture of this complexity, using a wide range of disciplinary approaches, which at the same time as providing more insight into policy processes, has also led to the proliferation of theoretical approaches:

> "Not the least of the reasons that [the study of] public policy has proved so unwieldy is that it is the property of everyone and no-one. The disciplines required to understand public policy cut right across the old academic lines of demarcation. Indeed, it is this interdisciplinary quality which makes the approach so interesting for both student and teacher alike. But the flipside of such a splendid single market of ideas and techniques wherein all the borders between disciples and sub-disciplines are breached is that the subject is always verging on complete fragmentation" (Parsons 1997:xv).

Aspects of the policy process have been productively explored by applying conceptual frameworks and methods from political science, institutional and organisational theory, economics, anthropology, systems theory, evolutionary biology and others. Choosing a theoretical approach for the current study thus poses a significant problem, which is largely due to the complexity of the policy process itself:

> "..given the staggering complexity of the policy process, the analyst *must* find some way of simplifying the situation in order to have any chance of understanding it. One simply cannot look for, and see, everything" (Sabatier 1999:4).

The process of simplification requires the construction of theoretical frameworks which rest on a set of presuppositions, which direct the observer's attention to certain features of the policy process and exclude others, and "define the categories in which phenomena are to be grouped" (Sabatier 1999:4); having made sense of the policy process in this way, the theoretical framework has certain *explanatory capacities*, based on the resultant simplified image of the process. Different presuppositions thus lead to different explanatory capacities. There is also an element of conceptual disagreement between theoretical frameworks, even with regard to basic concepts such as 'policy'; many of these concepts meet Gallie's criteria for 'essentially contested concepts' (Gallie 1956, Connolly 1983), and thus different conceptions cannot be resolved either empirically or analytically.

These points are illustrated by Allison and Zelikow in their detailed study of decision-making leading up to and during the Cuban Missile Crisis (Allison & Zelikow 1999), in which three different theoretical frameworks were applied[3]. At the end of this process, the question of which approach was superior cannot be clearly answered, since

> "..not only do [different] lenses lead analysts to produce different explanations of problems that appear, in their summary questions, to be the same. Lenses also influence the character of the analyst's puzzle, the evidence assumed to be relevant, the concepts used in examining the evidence, and what is taken to be an explanation." (Allison & Zelikow 1999:385).

Although differences between theoretical approaches cannot be empirically resolved, applying multiple frameworks did however possess significant advantages, partly because of the *conceptual capabilities* of different theoretical approaches (Allison & Zelikow 1999:386). By contrast, a comprehensive survey of theoretical frameworks undertaken by Lane as a prelude to his study on institutional reform in higher education in Sweden concluded that

> "..it is hardly possible to argue that one of these approaches to the policy process is superior to the others.. ..The search for one true approach to the public policy process is a venture bound to fail" (Lane 1990:39).

Lane's use of a number of 'metatheoretical criteria' such as "deductive power or falsifiability, scope of applicability, degree of confirmation or realism, coherence, simplicity, and practical usefulness" (Lane 1990:3-4), might have helped to rationalise his choice of a new institutionalist framework for his study, but the grounds on which he made his decisions were largely

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[3] These were the Rational Action Model (explaining decisions through assuming that the agent maximises his/her/its rational interests), organisational theory, and bureaucratic politics.

pragmatic, based on the "affinity" of a specific theoretical framework with both the subject material of his study and the kinds of questions which he wanted to explore (Lane 1990:38).

The approach used here to select a theoretical approach is based on a combination of Lane's pragmatism and Allison and Zelikow's advocacy of the potential for a "multiple lens" to develop a more complex understanding of a specific set of policy phenomena, a point of view supported by Kingdon (1995:77-80), and Sabatier:

> "Knowledge of several different perspectives forces the analyst to clarify differences in assumptions across frameworks, rather than implicitly assuming a given set. Second, multiple perspectives encourage the development of competing hypotheses that should lead ideally to "strong inference" – or at least to the accumulation of evidence in favour of one perspective more than another. Finally, knowledge and application of multiple perspectives should gradually clarify the conditions under which one perspective is more useful than another." (Sabatier 1999:6)

Given the close relationship between theoretical frameworks, key research questions, and the identification of pertinent data, the procedure followed in this study was to conduct a basic review of competing policy frameworks, review the material in question, outline broad characteristics of the material, identify key questions, and use the latter two processes to identify several theoretical approaches which were a) compatible with the scope and nature of the case material, b) able to provide insight (if not definitive answers) into the key research questions, and c) if possible, complementary in approach and likely results. Further in-depth research was then conducted, (included a period of participant observation[4], and use of interviews to supplement the sparse documentary record), the results of which forms the bulk of the thesis.

Broad parameters of the case material are:

- *The broad historical context*: the period under consideration spans a period of significant political change in South Africa, from an apartheid to a post-apartheid state, which involved significant changes to both the content and context of policy and policymaking. On the other hand, there were significant continuities in policy across the transition.
- *The character of state institutions*: apartheid state institutions were a direct legacy of South Africa's former status as a colony of the United Kingdom, and thus resembled UK institutions (in their historical form) closely. These were reformed by the post-apartheid state, but similarities remain.
- *Contrasts between the development of the South African energy system and others*: the South African energy system retained a significant dependence on coal, and did not

[4] The author spent two years (2001-2002) as the ANC's parliamentary researcher for Minerals and Energy, primarily doing research on minerals and energy policy issues for the chairperson of, and the ANC caucus in, the Portfolio Committee for Minerals and Energy.

undergo the transition to oil and other energy carriers as did other countries from the 1950s to the 1960s.

- *The emergence of a new area of policymaking*: the study encompasses the emergence of energy policy, which was accomplished through both the integration of existing energy-related policy activities, and the development of new energy policy-related institutions.
- *A historical perspective over a long time period*: most events in the development of energy policy in South Africa took place from the 1960s to the present, but the antecedent areas of policy activity (individual energy supply sector policies, and various other antecedent institutional innovations such as planning) began long before this, the first beginning before the formation of South Africa in 1910.

Key research questions are:

- What were the causes of the apartheid state's decision to embark on the energy policy project?
- How did the differences between the development of the South African energy system and others, and apartheid, influence the development of energy policy institutions and policies?
- What were the key factors in determining energy policy choices?
- What was the relationship between decision-making processes in energy policy processes, sub-energy policy processes (for instance, electricity policy), and other decision-making processes?
- What were the continuities and differences between apartheid and post-apartheid energy policy and institutions?
- How influential were the changes in the general political environment from apartheid to post-apartheid on energy policy processes?
- Can South African energy policy be understood in terms of a policy paradigm, or sequence of paradigms, and what were the processes by which the paradigms were defined?

Given the small number of actors in the development of energy policy and the continuity of their presence in the energy policymaking process, and the complex structural features which characterised the energy policy subsystem, an approach based on policy networks was chosen as the main theoretical approach for the study. Two other complementary theoretical approaches were also chosen: the first, the 'multiple streams' approach (Kingdon 1995) was chosen on account of its potential to illuminate relationships between policy processes and broader political processes; the second is an approach based on the theory of organisations and institutions, which was chosen because of the centrality of institutional innovation in the development of South

African (and other) energy policy. Below is a brief discussion of definitions of key policy-related concepts, followed by a more detailed discussion of the approaches specified above, and a conclusion outlining the way in which these theoretical approaches will be applied to the historical data.

Concepts and Definitions

Contrasting theoretical approaches to the policy process rest on differing conceptions of 'policy' itself, which, as well as posing a conceptual problem, poses a practical methodological problem: how to identify policy phenomena as such in a specific area. While the conceptual problem probably cannot be definitively resolved, the aim of this discussion is to reach a practical resolution of the methodological problem. Almost all conceptions of policy share the basic attribute of policy as a form of intention, norm or 'decision-rule', a higher-level principle which can establish the scope for lower-level decisions and/or actions; other attributes can be expressed in terms of three dimensions.

The first of these dimensions consists of a continuum from policy as decision-making to policy as norms. Identifying policy in the first case is relatively simple: policy is an output of a state decision-making process (Dror 1968:13); in the absence of a decision, there is no policy. In the second case, policy is a set of norms revealed through state action, which do not require a specific decision-point, or a conscious endorsement by key political actors (Vickers 1995). If a state decides one thing and does another, then the first concept would define the policy as being the result of the decision-making process (and something previous to and separate from action), and the second, the principles underlying the action which actually results (conceptually separate from action, but in reality inseparable).

The second dimension is a distinction made concerning legitimacy, which is a key aspect of policy, and the complexity of state institutions. At one pole, policy is conceptualised as a unitary state-sanctioned entity for which governments[5] should be held to account (Hogwood & Gunn 1984), and at the other pole, policy is conceived as a complex interaction of different decision processes in multiple (and often competing) state agencies (Smith 1991,1993; Wildavsky 1979); the complexity renders the problem of accountability more complex. For the former view, policy corresponds to what the state actually does (if "..parliament enacts a law.. ..but provides insufficient resources and generally does little to enforce it, then we are entitled to say that the

[5] The difference between the term 'state' and 'government' is not often clear, but is important. In this context, 'government' will generally be used to indicate the executive, comprising the political leadership of the state, whereas 'state' will be used to indicate the totality of public institutions. Thus, the state includes the executive, but also other state agencies. There is a significant debate on whether organisations such as state-owned enterprises form part of the state; in the following study these are generally referred to as 'state agencies', since the South African government clearly regarded them as such in the 1970s and 1980s, and drew a sharp distinction between these and private companies.

Government's policy is not to implement its own law" (Hogwood & Gunn 1984:21)), whereas for the latter, action does not flow from the state per se (which is, according to Smith, just a collection of institutions), but from a range of often competing state agencies (Smith 1993:50); thus, conflicting policies are frequently espoused by competing agencies, which makes deducing policy from state actions much less straightforward.

The third dimension is a distinction between policy as a discrete set of decisions (the output of a 'decision-making moment'), and as a continuous process of adaptation and modification. Adherents of the former view require policies to be endorsed by formal decision-making processes by credible (politically and institutionally legitimate) authorities, which are relatively infrequent, whereas adherents of the latter view regard policy as a 'work-in-progress', which is constantly revised and elaborated, including during implementation. The former view would delineate policy far more narrowly, whereas the latter view would include a far wider range of pronouncements, programmes and processes. This is underpinned by another distinction: whereas the former view would tend to regard the line between policymaking and administration, and between policymaking and implementation, as being fairly well-defined (sometimes institutionalised), the latter view would not, both because of the frequent involvement of administrative officials in policy processes, and because of the undefined relationship between detailed programmes and policy frameworks. A further division of theoretical policymaking frameworks related to this dimension is the division between theories which subscribe to what Sabatier refers to as the "stages heuristic" (Sabatier 1999:6-7), which encompasses theories which portray policymaking as taking place through a sequential series of 'stages' (from agenda-setting to implementation), and others, which portray policymaking as a far more complex and interactive process: in terms of Sabatier's distinction, the three theoretical approaches elaborated below do not subscribe to the "stages heuristic".

Here, we will make use of a conception of policy based on Ham and Hill, who define policy as a 'web of decisions', consisting of both formal policy decisions, and other less formal decisions made in different phases of the policy process. These decisions are linked together into a web in two related ways: the first is a temporal succession of similar decisions, whereby policy decisions are elaborated, refined and transmuted, and the second is a structural elaboration of a policy framework, where one or more policy decision(s) is augmented and/or interpreted by a series of less important and more specific decisions, which contextualise and define the initial decision(s), and establish links to other areas of decision-making. Actual policies pertaining to a sphere of state activity can be understood as this 'web', which is often not well-defined, and sometimes contradictory:

> "..the definitional problems posed by the concept of policy suggest that it is difficult to treat it as a very specific and concrete phenomenon.. ..it is hard to identify particular occasions when policy is made.. ..it tends to be defined in terms of a series of decisions, which, taken together, comprise a more or less common understanding of what policy [in a specific sector] is" (Ham & Hill 1984:11-12).

In fact, the definitive decision-making 'moment' in organisations is often difficult to identify. While there are rare moments where formal policy positions are pronounced by the executive, these are inevitably the culmination of a long process of decision-making, or the rationalisation of policy positions espoused by other state agencies:

> "..in real life, what at first sight appears to be a deliberate decision is apt to turn out to be the formal culmination of a slow process of commitment over a period of time, in which the range of possibilities has gradually been narrowed as different members of the organisation contribute to it in their turn. Decisions cannot often be attributed to one person, or even to a group of people consciously acting together at one time." (Brown & Steel 1979:175).

Ham and Hill also suggest that policy 'evolves' further in the 'implementation' phase (Ham & Hill 1984:11-12) as policies are elaborated and details are sketched in; this process not only provides a more detailed and specific policy framework, but also specifies more precisely what the policies *mean* in a specific context, which is to all intents and purposes a continuation of policymaking.

This conceptualisation of policy fits into the above three dimensions of policy concepts as follows. In terms of the first dimension, policy as a 'web of decisions' favours the concept of policy as decision-making, that is, as a conscious act by agents of the state; however, it is not necessarily a well-delineated process. In terms of the second dimension, policy is more of a complex, multi-agency phenomenon than a set of positions we can attribute to the state as a unitary actor; however, policy has several functions, and it is possible to distinguish, within this complexity, a political function (policy as the expression of a political position, or as part of a platform for a coalition), and an administrative function (policy as a decision-making framework, or as a programme goal); since policy fulfils both these functions simultaneously, there is in almost every case a constant tension between them.

In terms of the third dimension, we subscribe here to an approach which is more continuous than discrete, and more the *output of a system* than the *culmination of a process*. To that end, the concept of *policy activity* is defined as any activity related to, and with the intention of, making policy, which includes analytical activities such as policy-oriented research, analysis, and the specification of policy alternatives, political activities such as lobbying and coalition-building, and other activities such as networking and relationship-building. Policy activity takes place within a *policy environment*, a concept akin to Wildavsky's concept of a 'policy space'

(Wildavsky 1979:64-66), which consists of policies pertaining to a specific *policy domain*, which will be defined below. 'Policy density' is the measure of the intensity of policymaking within a specific policy domain; a specific domain (for instance, welfare), might contain policies from a number of competing agencies (a high policy density), which places constraints on future policymaking, or it might contain few or no policies (a low policy density), which gives *carte blanche* to agencies seeking to establish policies in that domain.

The policy environment consists of two sets of elements: the 'background' consists of the whole conceptual structure of the policymaking process (including agendas, alternatives and existing policies), and the foreground consists of actors which enter the policy environment when their actions are policy-oriented, i.e. when they seek to undertake any activity the aim of which is to influence the outcome of a policymaking process. A *policy domain* is an area of policy delineated by a set of state-sanctioned institutions (usually corresponding to an organisation such as a government department, and/or a corresponding function in the executive). The way that policy domains are delineated is extremely significant for policymaking processes, since the delineation process largely determines lines of authority in making and implementing policy. Domains inevitably overlap partially, which results in policies in the same domain being made by different agencies, usually with different perspectives. For instance, in South Africa electricity policy is overseen by a Department of Minerals and Energy, but the state-owned electricity utility reports to a Department of Public Enterprises; a significant portion of the electricity distribution industry resides in local authorities, which are powerful political entities in themselves, and are overseen by the Department of Provincial and Local Government. Domains are not static; they are created, expand, contract and disappear for a number of complex reasons, with significant consequences for policymaking activity.

Any consideration of policy in a particular policy domain will reveal a conceptual structure: the organisation of policies into broader 'policy frameworks', which have been variously categorised in a strong and a weak sense. Weak categorisations of policy frameworks attribute no special significance to them, other than as a form of 'meta-policy', a set of unifying concepts or values which underpin specific policies. Strong categorisations, however, in terms of 'policy ideology' (Smith 1991, 1993), 'policy paradigms' (Smith 1993, Menahem 1998) or 'policy regimes' (Wilson 2000), make a distinction which has significant explanatory power between policies and policy frameworks, which centres on the problem of policy change: the distinction is best elucidated by Sabatier (1988:144), who distinguishes between 'Core Policy Beliefs', and 'Secondary Aspects'. The former consist of broad policy principles and strategies, and the latter consist of individual policies and strategies aimed at achieving the Core Policy Beliefs. Policy change can thus be categorised into two types: the first consists of changes in individual policies,

which does not involve significant deviance from the 'Core Policy Beliefs', and the second is a change in the overall policy framework. For purposes of clarity, and a conceptual commitment to the theory of policy communities, in this study we will use the term 'policy paradigm' to refer to policy frameworks or 'Core Policy Beliefs', which will be further elaborated on below. Thus, minor policy change involves changes only in individual policies, whereas major policy change involves change in the policy paradigm itself. Policy activity, as outlined above, is in most cases orientated towards the elaboration of individual policies within a larger framework, and less commonly towards the development of a new policy paradigm.

Finally, in the current study, it was evident that within a specific domain (in this case, energy policy), different policies or sub-areas of policy were contrasted by different levels of policy activity, different degrees of implementation, and different levels of resource allocation for implementation and policy activity; in order to describe and explain these differences, we will introduce the concept of *actualisation* of policies. The degree of actualisation of policies is reflected in a) the degree of ongoing policy activity, b) the resources dedicated to implementation and further policymaking in the same area, and c) the degree to which the policy has been matched with implementation capacities. Actualised policies are thus matched with appropriate organisational capacity, their implementation is well-resourced, and further policy initiatives are being pursued in the same area; by contrast, non-actualised policies are not matched with appropriate organisational capacity, implementation is not well-resourced, and there is little or no pursuit of further policy initiatives. In terms of the above conception of policy, actualised policies are comprised of an extensive web of decisions, and actively-pursued links to other related areas of policy activity, whereas non-actualised policies are comprised of a very limited web of decisions, and are not well-integrated into other potentially related areas of policy activity: this will be further elaborated in the section on institutional and organisational aspects of the policy process further below. First, various approaches to conceptualising and explaining the structure of the policy environment will be discussed.

Policy Networks and Complex Policy Spaces

Since the 1960s, students of public policy have taken an interest in what were termed 'policy subsystems', a term used to describe the patterns of enduring relationships between state actors and others in the policy environment within a specific policy domain; these patterns were noted in the US in policymaking processes in transport, agriculture and education, where stable relationships existed between congressional committees, government agencies and interest groups (Howlett & Ramesh 1995:125) which formed 'iron triangles' or 'policy monopolies', largely excluding other potential participants from the policy process. Policy theorists in the UK

developed the concept of the 'policy community' to describe the close collegial and sometimes institutionalised relationship between state agencies and other actors (particularly interest groups) in specific policymaking processes. These 'communities' provide participants with a significantly-enhanced opportunity to influence policy outcomes, as well as providing the state with a high level of co-operation from key non-state actors in a specific policy domain. This work was developed into general theories of 'policy networks', which has rapidly developed into the "..dominant paradigm for the study of public policymaking" (König 1998:387).

Policy theorists are not however in agreement concerning the nature and membership of networks, and there are several different approaches to classifying and delineating these. Smith and other theorists such as Rhodes and Marsh (Rhodes 1992, Rhodes & Marsh 1992) tend to identify the key members of policy networks, and particularly policy communities, as interest groups and state agencies[6]. Members are identified through "resources dependencies" (Smith 1993:58), and networks are held together by mutual interests in resource exchange; thus the interaction in policy networks is predominantly strategic. One of the criticisms of this approach is that it tends to underestimate the role of experts such as scientists and other policy analysts, which might have less significant (or more one-sided) resource dependencies, and emphasises the interplay of strategic interests at the expense of ideas in the evolution of policy (Sabatier 1988:131).

An alternative approach to policy communities is advocated by Kingdon (1995), who defines policy communities as the collection of "specialists in a given area" (Kingdon 1995:117), which includes any individual from within a government agency or an interest group who a) has expertise in a specific policy area, and b) who is a regular participant in policy deliberation, advocacy or analysis in that area. The central activity of policy communities is thus communicative rather than strategic, although the work done by Smith's conceptualisation in explaining strategic interactions is done elsewhere in Kingdon's model. Although Kingdon's concept shares some of the features of Smith's (including a tendency to limit policy alternatives through various forms of consensus), it represents a smaller subset of actors in the policy environment. Another key difference is that Kingdon's communities tend to consist of individuals (albeit with strong organisational affiliations) organised into tight networks which develop limited consensus on alternatives, whereas Smith's communities consist largely of groups with mandates to negotiate policy outcomes.

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[6] For theoretical purposes, the distinction between the roles of actors in policy communities is easiest to express as a distinction between stakeholders and state agencies (and the following discussion will use this distinction), but in reality these roles are often considerably blurred, especially when stakeholders are state agencies (such as state-owned enterprises or other 'quasi-state agencies'). It thus makes sense to distinguish an actor or actors in a policy community which are *legitimate state policy agencies*, i.e. which have the formal *function* of making policy in a specific area on behalf of the state, from those which are not, and thus have a monopoly on this 'resource'. There are still occasions where publicly-owned or privately-owned stakeholders fulfil this function to varying degrees; thus every case needs to be assessed on its merits.

A third and significantly different approach is advocated by Sabatier and Jenkins-Smith (Sabatier 1988; Sabatier & Jenkins-Smith 1999), who propose a different structural approach to policy subsystems, which they divide into a number of competing 'advocacy coalitions', which vie for influence on policymaking in a particular sector over time. These coalitions are

> "..composed of people from various organisations who share a set of normative and causal beliefs and who act in concert" (Sabatier & Jenkins-Smith 1999: 128).

Members of coalitions have three-tiered belief systems, consisting of 'Deep Core Beliefs' (basic values and ideological orientations), 'Policy Core Beliefs' ("basic strategies and policy positions for achieving Deep Core beliefs in the policy area/subsystem in question"), and 'Secondary Aspects', consisting of "a multitude of instrumental decisions and information searches necessary to implement the Policy Core in the specific policy area" (Sabatier 1988:144). The criteria for membership of a particular advocacy coalition is that one shares Policy Core Beliefs with other members, and that one interacts with them in developing knowledge and strategies aimed at improving the coalition's chances of influencing or determining policy. Membership of advocacy coalitions thus embraces a much larger group of actors than policy communities, and a more plainly activist role is attributed to experts. Another important distinction is characterisation of policy frameworks as belief systems, and the consequent subordination of strategic interests to beliefs in policy subsystems, since according to Sabatier, interests do not exist prior to interaction with the policy subsystem, but are formulated and refined during interaction with the policy process within advocacy coalitions (Sabatier 1988:131,142).

These different accounts have various characteristics which simplify a choice of approach in the current study. There are two contextual features which are significant. The first is the provenance of the approaches: both Sabatier and Kingdon developed their approaches from studies of the US political system, whereas Smith's approach is based on research in the UK political system. One of the key features of the US political system is its federal structure, which renders policy processes far more open and multi-faceted than in the UK, which has a far more centralised, closed policy system. The South African political system was and is far closer to the UK system in this respect, since key institutions (particularly before the abolition of apartheid) are modelled on those of the UK. In addition, the apartheid state imposed further restrictions on access to policy processes.

The second is the difference between the South African policy environment and those of both the UK and the US, which can be summed up in terms of resources available for policy activity. Not only were state resources more limited, but societal resources for participation in policy processes were far scarcer. In addition, other barriers to entry existed under apartheid, both on account of the restriction of political activity (formally in terms of a bar on black participants,

and informally through the zealous exclusion of dissenters), and because of the authoritarian character of the apartheid bureaucracy.

Initial examination of the data on energy-related policy activities, as well as other areas of policy in South Africa, seems to indicate that the impact of the above factors on policy processes generally was to significantly limit the number of participants into tightly-defined networks and to privilege strategic interaction over conceptual innovation; other groups (including experts and civil society groups) had a very tenuous presence in policy subsystems. This would indicate that Smith's approach will be more useful, and that the alternative, Sabatier's theory of advocacy coalitions, will be far less useful as an overall approach to explaining policy change, particularly in the apartheid era, since initial analyses of the data for this study raised the question as to whether there was more than one advocacy coalition in some energy policy-related domains (given Sabatier and Jenkins-Smith's stringent criteria (Sabatier & Jenkins-Smith 1999: 128)); one advocacy coalition per policy subsystem would probably behave in similar ways to a policy community[7]. The concept of an 'advocacy coalition'[8], as well as Kingdon's 'multiple streams' approach (discussed further below), however, will be applied in a limited sense to remedy the one lacuna in Smith's approach, the role of experts in policy subsystems (and particularly their role in alternative specification).

The analysis of policy networks can be regarded as the first of two levels of analysis in exploring the structure of the policy environment: the second level is concerned with complex interactions of various sorts between different foci of policy activity. In reality, almost every policy domain is related to a set of other domains, since the complexity of contemporary societal systems renders completely autonomous policy domains impossible; however, the way in which the relationships between different policy processes are *institutionalised* is of central importance. Below, a theoretical approach to policy communities (as proposed by Smith and others) will be outlined and discussed, before building on this discussion to investigate alternative ways of conceiving more complex structural relationships in the policy environment.

Typology of Policy Networks

Policy networks have been variously defined (Smith 1993:56-60; Parsons 1997:184-194; Thatcher 1998:391-395). Three salient characteristics are a) that networks consist of state agencies and other groups which have an interest in a delineated area of policy; b) that some

[7] There is possibly significant scope to apply the advocacy coalition framework to South Africa and other developing country policy processes with more adaptation and research, and particularly to post-apartheid South Africa, but very little use will be made of it here as a theory of policy change (see below).

[8] Although it does not fit easily into the theoretical framework proposed by Smith, the concept of an 'advocacy coalition' seemed to describe quite closely the succession of 'energy policy advocates' which formed a consistent part of the energy policy project over the last three decades, particularly in emphasising the *continuity* of their role (for which the advocacy coalitions approach is admirably suited), which was underplayed by other approaches: this will be discussed in more depth in the final chapter.

contact and exchange of information occurs between participants; and c) that to varying degrees, there are mutual resource dependencies between participants (Smith 1993:56-58; and Smith 1993:58 after Rhodes 1992:77-78). Policy networks vary considerably, from relatively loosely structured 'issues networks', characterised by a large number of participants, infrequent contacts between participants, low barriers to entry, and a low degree of resource exchange (Smith 1993:62), to 'policy communities', characterised by a tight structure, a small number of participants, frequent (even institutionalised) contact between participants, high barriers to entry, and a high degree of resource exchange (Smith 1993:64). Whereas issue networks are characterised by the participation of multiple state agencies (frequently in conflict), policy stalemates (lack of consensus) and open access, policy communities are characterised by the participation of one state agency (which has a dominant position within the state in sanctioning policy in a specific domain), closed access and a high degree of policy consensus. One of the important elements of policy communities is exchange of resources, which is the key motivation for the participants to sustain a policy community; since policy communities are the policy networks with the most relevance for this study, these will be discussed in some detail below.

The Origins and Sustainability of Policy Communities

Policy communities are based on the reciprocal exchange of resources, as well as on several other forms of mutual benefit. Resources are of two kinds: the first is information (state agencies possess political information, and other actors possess other kinds of information not necessarily available to the state), and the second is influence; state agencies deliver influence over policy outcomes and regulatory systems, and non-state actors deliver the co-operation of their constituents in the implementation of policy changes. Policy communities are a means for the state to increase what Smith terms the "infrastructural power" of the state (Smith 1993:52), which, particularly in complex modern states, involves the extension of the state's influence over specific areas of society through the development of relationships with key civil society groups, and the implementation of new institutions; these in most instances require the co-operation and involvement of key stakeholders: whereas the state has extensive formal powers, its real power in different social and economic domains is related to its infrastructural power in these domains. The alternative to infrastructural power is "despotic power", or various forms of coercion, the

exercise of which is very risky for the state[9]. Thus, by comparison to an issue network, where there are clearly policy winners and policy losers, in a policy community:

> "..power is a positive-sum. In other words, a policy community does not involve one group sacrificing power to another. It could involve each group in a mutual expansion of power as each increases its influence over policy" (Smith 1993:64).

Policy communities thus involve an expansion of localised state power (in the specific policy domain). This in turn is dependent on the various actors in the policy community having a legitimate mandate from their constituencies. State agencies have to guarantee that they have a dominant position, or a monopoly, on the influence that they bring to the community, which implies that a competing agency can undermine the effectiveness of the policy community if they can offer similar influence within the state as a whole. Other groups have to guarantee that they have a dominant influence over their members, and can guarantee their co-operation with policy changes. This has two effects. The first is to "depoliticise" policymaking, since policy communities function as conflict-resolution mechanisms between state agencies and stakeholders, and effectively exclude non-members from the policy processes, thus avoiding the airing of policy conflicts in broader political spheres. The second is that the risks of policy change are minimised: for the state, co-operation of stakeholders is assured, and for stakeholders, risk of adverse or unexpected policy change is minimised, and policy-related strategic goals can be more easily pursued. The establishment of policy communities also potentially enhances the prestige and influence of state agencies vis-à-vis inter-agency rivalries.

Access to policy communities is generally limited, and requires participants to follow the 'rules of the game', which include using 'insider' tactics in advocacy, not taking an oppositional stance in public, and keeping demands within a specific framework. In an actual policy environment, this structure is likely to be more complex, depending on the interest and issue structures involved. There is usually a "core" and a "periphery" or a "primary" and "secondary" community (Smith 1993:61); since specific sectors usually involve a complex structure of issues and sub-issues, not all actors will be involved in all these issues; some will have interest or influence only in a specific sub-issue that does not often arise, and thus have a more tenuous relationship with other players – other players will be excluded altogether. The significance of this is that the 'rules of the game' and the norms that are necessary for the existence of a policy

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[9] The contrast between 'infrastructural' and 'despotic' power echoes a long-standing debate in political philosophy on the nature of power (see especially Lukes 1974; Arendt 1972), between a concept of power based on the notion of 'power over', or the ability of one agent to influence another, and a concept based on the notion of 'power to', or the empowerment of an agent or group of agents to act in a specific context. This latter and more unusual conception of power is epitomised by Arendt's contrast between power and violence, which she defines as a lack of power; thus, if the state requires violence (or other coercive means) to achieve its aims, then it lacks power. Whereas despotic power is a straightforward reflection of the first (and more orthodox) conception, infrastructural power is closer to the second, in that a) this kind of power requires co-operation and co-ordination, and b) it is undermined or destroyed by the exercise of despotic power.

community are usually set by the core actors. Networks can shift significantly for specific issues, integrate or de-integrate with other networks, can have a diversity of state actors, interstate actors, or non-state actors.

Policy Consensus, Policy Paradigms and Policy Change

For a community to exist, there should also be a degree of consensus on policy, and on the framework within which policy is made. In a situation where there is long-term stability and little membership change in a policy community, consensus in a policy community often goes beyond this:

> "In fact a policy community often has more than a consensus; it actually has an ideology which determines the community's 'worldview'. Ideology is a way of making sense of the world by defining and ordering it. Ideology defines not only what policy options are available but what problems exist. In other words, it defines the agenda of issues with which the policy community has to deal" (Smith 1993:62).

Policy communities develop 'policy paradigms', which Menahem (following Hall) defines as:

> "..the system of ideas and standards that specify the goals of policy, the kind of instruments that can be used to attain them, and the very nature of problems they are meant to address" (Menahem 1998:283)

Policy paradigms consist of three basic features. The first is a conception of how the policy domain is defined: what policy issues a specific domain involves, and who the relevant actors are; the second is a consensus regarding broad policy goals, and the third is a representation of valid policy problems, and valid policy alternatives. This last feature is ascribed by Menahem to 'causal stories' which develop and are sustained within policy communities (Menahem 1998:288 after Stone 1988). Stone's conception of policy problems is in turn based on a "social constructionist" view (Stone 1988:282), in terms of which 'conditions' (which afflict people in various ways) only become 'problems' when it can be demonstrated that something can be done about them. In order to demonstrate this, the cause of the problem must be shown to be amenable to human intervention, if policy change is to be successful in tackling the relevant problem (Stone 1988:284-285). Almost all public problems have complex causes; the function of 'causal stories' is to portray a simplified narrative account of problems or conditions which demonstrate a simple causality, which excludes other causes and allocates responsibility (or non-responsibility) for a set of problems.

Under what conditions does major policy change take place in policy domains which are characterised by an entrenched policy community? In terms of Smith's framework, major policy change is usually linked to changes in the policy community itself; without changes in the policy community, little policy change is possible without the co-operation of the community (Smith

1993:96). Below are two case studies: one undertaken by Menahem (1998) of Israeli water policy, where an entrenched policy community successfully resisted policy change, and the other of food policy in the UK, where the policy community itself collapsed into a broader issue network, and the dominant policy paradigm was replaced.

In Israel in the early 1950s, promoting the growth of agriculture was perceived as a national priority, and was closely linked to early Zionist concepts of state-building. The primary function of water policy was to supply agricultural projects with whatever water these required at subsidised prices, so as to promote the expansion of agriculture. Since agricultural interests were thus seen as the key interest group in the water policy domain, a policy community based primarily on these interests was established and strongly institutionalised (given a formal power of veto). This led to the establishment of a water policy paradigm based on two principles: the first was that the problem was shortage of water supply, and the solution was to increase water supply (through discovering additional water sources), and the second was that since the primary aim of water policy was the growth of agriculture, water should be sold to farmers below cost (thus diminishing price incentives to save water) (Menahem 1998:291-295).

Both the policy community and the policy paradigm proved immune to repeated water crises, as well as potential legitimation crises caused by repeated reports on the Israeli water situation, which emphasised repeatedly that overextraction was damaging key aquifers. Although the importance of agriculture had declined, in economic and political terms, the strongly institutionalised nature of the policy community retained the dominance of the policy paradigm. Other state agencies were not able to successfully challenge its dominance, and resorted to non co-operation (Menahem 1998:296-300). The policy community was able to retain the policy paradigm by advocating desalination (a technocratic solution which avoided the possibility that institutional reform was urgently required, which would have moved policy outside the paradigm). Only when new paradigms began to impinge on the structure of the policy community itself, was the position of the dominant paradigm threatened (Menahem 1998:307).

There are several conclusions which follow from this case. The first is that past policies create and entrench policy communities, which are thereafter able to resist change for a considerable period after the resources of the community members (which was the basis for their inclusion in the community) decline:

> "..In view of the remarkable resilience of agricultural interests within the water policy network it can be suggested that the erosion of political power of participants outside the network appears to only gradually leak into the network itself.." (Menahem 1998:301)

The second is that the policy community was able to defend itself against repeated policy crises because the conditions of the existence of the community were not threatened, despite the

opposition of other significant state agencies; the only option left to the state would have been to have imposed institutional reform on the water policy domain, which did not happen during the period of the case study. The third significant conclusion was the ability of the community to apply its 'causal story' to deflect repeated scientific reports on the dire consequences of existing water policy, and recast them in terms of the dominant policy paradigm. When a central tenet of the paradigm (that new supplies could be developed) was too badly damaged by the facts, it was replaced by a strong commitment in the policy community to desalination, which was appealing because it did not pose a challenge to the existing institutional arrangements or paradigm.

By contrast, events which undermine the structure and integrity of the community itself have significant consequences for policy change, as illustrated by Smith (1991) in a study of the changes in the food policy network in response to a political crisis in the form of Salmonella infection of eggs. Food policy in the UK was tightly-controlled by a policy community dominated by agricultural interests and government technocrats, established after the second world war with the primary aim of maintaining food security. From then until the 1980s, there was a growing public concern with food safety, which promised to supplant the old policy paradigm (a shift of emphasis from a focus on food security and production to a focus on consumer health and safety). Change was resisted by the policy community until a political crisis broke out in the mid-1980s (Smith 1991:240), which divided the policy community in two important ways: first, the control of food policy by the state's agriculture bureaucracy was threatened by the state health agencies' growth in interest in food safety; and second, conflicts of interest which grew amongst members of the policy community (specifically farmers and retailers). The result was that the policy community was unable to maintain a consensus and food policy was "politicised"; the tightly-structured policy community evolved under the weight of the crisis into a more loosely-structured issue network, with a significantly greater number of participants, and a broader policy domain (Smith 1991:253-4).

In the more extreme case of regime change (which is directly applicable to the present study), policy communities can survive if the same resource dependencies are re-established between interest groups and the new regime. New regimes do not usually have, but do require, detailed policy programmes, which are often provided by existing policy communities. Thus, although regime change can lead to policy discontinuities, existing policy communities can often facilitate a high degree of policy continuity, which will be one of the central questions explored in the current study. Thus, minor policy change, in response to threats to the policy community, is usually accomplished and managed within the policy community, which is able to resist more significant policy change, whereas major policy change, or a shift in policy paradigm, is only accomplished if the policy community itself is undermined.

Complex Policy Structures

In most cases, theories of policy networks focus on networks which correspond in a fairly straightforward way with single policy domains. Since in reality most policy domains are not discrete, however, there are a large number of ways in which networks interact: one network might be 'nested' inside another, or might intersect with another (Sabatier & Jenkins-Smith 1999: 136); networks can 'expand' and 'contract' to encompass subsets of policy issues (Smith 1993:66). Some policy domains are quite integrated, whereas others are 'fragmented' to a large extent (Kingdon 1995:118-119). Conceiving these relationships can be slightly simplified through Dery's distinction between areas of policy which are 'policymaking' and areas which are 'policy-taking' (Dery 1999:163). The former are characterised by 'primary policies', and policy-makers "implicitly presume control over the key variables that shape policy in a given area", whereas the latter are characterised by 'policy by the way', which is "..primarily or entirely shaped by the pursuit of other objectives.." (Dery 1999:165); in other words, determined by other policy processes elsewhere. The distinction rests on Wildavsky's concept of a dense policy space (outlined above), in which policies from competing domains strive for influence.

One of the features of a policy community, as outlined above, is the authority to be a 'policy maker'; policy domains which are primarily 'policy takers' are more likely to be loosely-structured issue networks. If a new policy domain such as energy policy is introduced, a significant challenge is posed both to both the autonomy and existence of existing policy communities which are operating in areas of policy related to the new domain, since the new domain would be accompanied by the creation of new state agencies. In terms of the theoretical framework outlined above, one would expect either a) a restructuring of policy communities, or b) successful resistance to change. The new policy domain might develop its own policy community; the key questions, which need to be answered empirically in each case, are a) how autonomous are the 'sub-communities', and which way does influence over policy flow, and b) what influence do the 'sub-communities' have on the policy paradigm of the overall community (assuming it exists)? The conditions for the sustainability of a policy paradigm based in a complex structure such as the one outlined above might be different from those outlined above for a 'simple' policy community; this is a central question which will be addressed in the study below.

Policy and Politics

The aim of this section is to conceptualise the relationship between energy-related policy phenomena and the political sphere, which will be approached primarily through a framework for agenda-setting and alternative-specification proposed by Kingdon (1995). The basis for this

framework is twofold. The first aspect is an account of policy agenda-setting based on a social constructivist, as opposed to a rationalist[10], conception of problem formation (Stone 1989:281, Kingdon 1995:114): problems are not objectively 'given', but arise within the political environment. People (or society) are beset by 'conditions' or 'difficulties', but these are converted from time to time into 'problems' which can be addressed by policy change, which are differentiated from the former by their amenability to state intervention (Stone 1989:282). The second aspect is a conceptual framework for explaining policy change which Kingdon adapted from Cohen, March and Olsen's 'garbage can' decision-making model (Cohen, March & Olsen 1972, March and Olsen 1994), which is based on the discrete existence of three streams of policy-related activity, namely problem recognition, policy formulation, and politics (Kingdon 1995:87).

'Multiple Streams': Problems, Policy Alternatives and Politics

The 'problem' stream consists of those issues which occupy the attention of "important people in and around government". While the number of potential problems (those which could be demonstrated to pose problems for a significant number of people) in a particular country is very large, the attention of the relatively small group of analysts, bureaucrats, politicians and others who populate the policy environment is limited, meaning that only a small number of problems reach prominence at one time. These are the problems which are usually addressed in some way, and matched to potential solutions in policy processes. The way in which problems become prominent in this way is usually a combination of two factors, which Kingdon terms "pervasive, necessary and powerful indicators" and "focusing events, crises and symbols" (Kingdon 1995:93-95). Unlike a rationalist approach to problem-formation, prominent indicators are a combination of empirical information, institutional capacities (to apply resources and organisational capacity to the processing of selected information), and legitimation. Some indicators (such as GDP or inflation) are almost universally accepted as of central importance, but the importance of others needs to be established:

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[10] Rationalist approaches to understanding policymaking are epitomised by two basic characteristics, well-expressed by Harold Lasswell in his ground-breaking paper in the 1950s, and Rothwell in his introduction to the collection containing Lasswell's paper (Lasswell 1951, Rothwell 1951). These are what Sabatier termed the 'stages heuristic', which conceives the policy process as a series of 'stages' (for instance, problem identification, policy alternative formulation, policy evaluation, and decision-making), and an instrumental-rational view of policy-related decision-making, which corresponds with the 'stages heuristic', since if policymaking is decision-making, rational policymaking is instrumentally rational, and therefore the stages should conform to an instrumentally rational decision-making process. Thus, policymaking should at its heart be a form of problem-solving through the application of knowledge-based techniques, or technology (in its broad sense). According to Lasswell (and many other policy theorists), problems exist objectively, and 'are out there' to be 'discovered' by diligent policy analysts, who ought not to be taken in by merely 'topical' issues: "..the basic emphasis of the policy approach, therefore, is upon the fundamental problems of man in society, rather than upon the topical issues of the moment.." (Lasswell 1951:8; see also Rittel & Webber (1973) for an incisive critique of a problem-based approach to policy and planning). On the other hand, a 'social constructivist' approach to problems emphasises that the process of converting issues into problems also 'frames' the issues by linking it to a cause, and thus to potential set of solutions; thus problems and solutions are 'constructed' together.

> "Demonstrating that there is indeed a problem to which one's solution can be attached is a very real preoccupation of participants in the policy process.. ..Constructing an indicator and getting others to agree to its worth become major preoccupations of those pressing for policy change.." (Kingdon 1995:93)

In order to indicate a problem, indicators needs to be interpreted:

> "..the data do not speak for themselves. Interpretations of the data transform them from statements of conditions to statements of policy problems.." (Kingdon 1995:95)

This process of translating requires that the *significance* of the potential problem is highlighted, which, according to Kingdon, is most often achieved by a problem-related event or series of events, which provides a simple narrative context to illustrate forcefully the *meaning* and *urgency* of the problem, particularly for less-visible areas of policy. For instance, in South Africa, paraffin use by poor households for cooking and lighting is a major problem. For about six years, this problem has been highlighted by annual studies which determine the alarmingly high number of people affected by either fires, burns or poisoning linked to paraffin use, but this data only reached the headlines once; the reason for this was that a) there had been a spate of fires in informal settlements in a short time period, and the media were looking for a 'story' behind them, and b) the paraffin angle was 'sold' to the media by an NGO, which skilfully connected fires and paraffin, and thus converted the fire problem into a paraffin problem. This process is referred to as 'framing' (Simons 2001:116-119), which is defined as selecting

> "..some aspects of a perceived reality and make them more salient in a communicative text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.." (Entman, quoted in Simons 2001:120).

Framing involves the reduction of a complex problem to a relatively simple causal relationship, which legitimates various types of intervention or non-intervention (Stone 1988:295). In addition, because of the mediated nature of problem-related events, their extent and impact is also dependent on structural media phenomena such as attention cycles[11] and a related preference for particular sorts of events (airline crashes over famines).

Problems fade from agendas for a variety of reasons. Since attention to a problem is usually a result of pressure from a wide range of sources (what Sabatier terms an 'advocacy coalition'), continued focus of attention on the problem requires the maintenance of the coalition. This is threatened by a number of circumstances. First, partial success (resulting in the implementation

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[11] Problems become 'news' when they are, literally, new, and their news value fades after this. This is ideally suited to events such as airline crashes, the relevance of which fades swiftly, but for more pervasive problems such as AIDS, newsworthiness is only brought about by a 'focusing event' which has some news value (such as the death of a celebrity, or the release of a shocking report); however, the media's attention declines as the event passes. Thus, attention is directed at AIDS-like problems in cycles, as focusing events come and go.

of policy measures) often removes the impetus for further intervention, since the problem has for many actors been 'addressed':

> "..to strategists pressing for a fuller solution, such a result may be more distressing than no passage (of policy-related measures) at all.." (Kingdon 1995:104)

Second, the coalition might dissolve if the problem is not addressed in the short term:

> "It takes time, effort, mobilisation of many actors, and the expenditure of political resources to keep an item prominent on the agenda. If it appears, even after a short time, that the subject will not result in legislation or another form of authoritative decision, participants quickly cease to invest in it.." (Kingdon 1995:104)

Maintaining an effective presence in the policy environment is costly, and particularly difficult for groups of actors such as consumers or socially-marginalised groups without access to a continuous resource base (Sabatier 1988:143), or a resource base which depends on visible and timely progress in focusing attention and effort on specific problems (for example, fund-raising from individuals). A third reason is the perceived costs of remedial measures, which might cause the problem's reversion to a 'condition' which cannot realistically be addressed; portraying a problem in this fashion (for instance, global warming, which is frequently portrayed as too costly to address in the short term) is a much-used and highly-effective strategy for removing problems from the agenda.

There is not, in Kingdon's 'multiple streams' approach, a direct causal relationship between problems and solutions. Potential solutions, in this case policy alternatives, are generated in a stream of relatively independent activity, and 'coupled' to potential problems when the opportunity arises. For instance, advocates for a federally-funded public transport programme in the US linked their 'solution' to three different 'problems' in sequence:

> "When a federal programme for mass transit was first proposed, it was sold primarily as a straightforward traffic management tool. If we could get people out of their private automobiles, we would move them about more efficiently, and relieve traffic congestion in cities, making them more habitable. When the traffic and congestion issues played themselves out in the problem stream, advocates of mass transit looked for the next prominent problem to which to attach their solution. Along came the environmental movement. Since pollution was on everybody's minds, a prominent part of the solution could be mass transit: get people out of their cars and pollution will be reduced. The environmental movement faded, and what was the next big push? You guessed it: energy. The way to solve the country's energy problem, so reasoned the advocates of mass transit, was to get people out of their cars when commuting.." (Kingdon 1995:173)

The type of activity which generates policy alternatives takes place in Kingdon's 'policy communities', collections of specialists in a wide range of different organisational contexts

which work in the same area of policy, and develop and communicate alternatives within the community. Possible alternatives develop in a "policy primeval soup"; in a process akin to natural selection, a few of these alternatives are developed into fully comprehensive potential policy programmes, on the basis of technical feasibility, "value acceptability" (amongst the specialists), and anticipation of future constraints. There are aspects to "value acceptability": the first are common ideological commitments, both intrinsic to the policy community, as well as anticipated external ideological constraints. The second are intellectual commitments to values such as efficiency and comprehensiveness. These combine to create a specific 'policy ethos', based on a historical set of policy deliberations; in a specific context, certain alternatives are regarded as 'feasible', and others are not (Kingdon 1995:132-5, Lindblom 1959:88). The process of selection creates a 'short list' of relatively complete proposals which have a good chance of being adopted. Consensus around policy proposals is primarily built on intellectual grounds, by communication and persuasion (Kingdon 1995:159).

By contrast, in the political stream, consensus is largely a product of strategic interaction of the type ascribed by Smith to policy communities, involving the construction of coalitions based on compatible and/or tradable strategic interests (Kingdon 1995:159-160). Kingdon uses the term 'politics' in a narrow sense to describe "electoral, partisan or pressure group factors" (Kingdon 1995:145), which excludes broader and more undefined political processes. Different sets of criteria are applied to policy alternatives in the policy and political streams:

> "Expertise [in the policy stream] presumes a process by which alternative theories are evaluated systematically against available data within a framework shared by "reasonable" (i.e. well-trained) people in order to rank ideas in terms of their plausibility. Politics presumes a process by which alternative policies are compared on the basis of the political resources of the people supporting them in order to rank programs in terms of their acceptability. On the surface, one process attempts to reduce subjectivity through standardised procedures designed to assure verifiable knowledge; the other attempts to organise subjectivity through a set of bargains designed to assure social stability. One process seeks data; the other seeks allies.. ..The classic outcome of confrontation of contending ideas among experts is the confirmation of one and the rejection of the others; the classic outcome of confrontation of political ideas is the building of a coalition that makes compromises among some in order to exclude others." (March & Olsen 1989:30)

The aim of political reasoning is to build constituencies for action (Stone 1988:308); whereas policy specialists often develop commitments to policy positions in themselves, actors in the policy stream almost always have secondary strategic motives for embracing policy positions. Kingdon identifies three types of influence in the policy stream: a "national mood", organised political forces, and government agencies and institutions (Kingdon 1995:146). Changes in the

"national mood" are unpredictable, and frequently cyclic, and render certain policy alternatives politically viable and others unviable. Organised political forces, on the other hand, such as interest groups, enter the policy environment with clearly-defined strategic goals; by contrast to analysts in the policy stream, interest groups are not committed to specific policy outcomes, but merely to outcomes which favour them strategically. Since interest groups will support or obstruct policy change according to these criteria, achieving specific policy changes requires the building of coalitions, as does opposing policy change. Opposition from organised political interests can however be overcome by other changes in the political stream (in the national mood, or in government), or in changes in the structure of interests themselves (Kingdon 1995:152). The third factor is government: changes in government, including elections, changes in key personnel, changes in jurisdiction, and competition between agencies, can also have significant effects on the political stream.

'Policy Windows', 'Coupling' and Policy Change

Kingdon's theory of major policy change involves the interaction of the three streams outlined above: policy alternatives are matched to problems, and coupled with a coalition of favourable political forces. These fortuitous events are related to the occurrence of 'policy windows', which are 'windows of opportunity'[12] for policy change. Policy windows open in the problem or the political stream: at certain times, attention is focused on specific problems (by crises or other events, or even by regular events such as elections or budgeting processes), or changes in the political stream create a favourable atmosphere for specific policy proposals (Kingdon 1995:173-175). When windows open, potential exists for the streams to be 'coupled', for policy proposals to be linked with problems, with sufficient political impetus to win acceptability. The actual process of coupling is often brought about by actors that Kingdon refers to as "policy entrepreneurs", which can be any actor which is:

> "..willing to invest their resources – time, energy, reputation, money – to promote a position in return for anticipated future gain in the form of material, purposive or solidary benefits" (Kingdon 1995:179)

The probability that policy change will take place is thus increased if a) there is a plausible policy alternative available, b) there is a matching policy window in the problem or political stream (or both), and c) there is a policy entrepreneur(s) who is prepared to facilitate the coupling of the streams. Policy windows create an opportunity for policy change, but do not stay open long; if the opportunity is missed, then policy change does not occur (Kingdon 1995:169).

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[12] Kingdon's original metaphor was 'launch windows' for spacecraft, which are only 'open' for very short periods of time. If a launch does not take place, the next 'window' must be awaited.

Kingdon's account of policy change is conceptually different from theorists such as Smith, and difficult to compare directly; however, the one element which these approaches have in common is the importance of 'focusing events', which result in the glare of public attention being directed at a specific policy domain. Whereas a policy community (Smith's conception) would normally be able to keep issues off the government's problem agenda, the occurrence of a crisis makes this very difficult, and weakens the policy community's ability to exclude participants, or divides the community itself and destroys the existing consensus. Such an occurrence can be termed a *policy crisis*, a situation which demands a policy response from the government. If the existing policy community can respond with a plausible policy alternative, or resist pressure for change until the crisis fades and the 'window' shuts, then only minor policy change results, whereas if the crisis leads to the collapse of the policy community, then major policy change is more likely, which is contingent on the availability of plausible policy alternatives; if these are absent, no change is likely.

Ideas and Politics

An aspect of Kingdon's model which is superior to that of the network models addressed above is his approach to the specification and elaboration of policy alternatives, via a 'policy community' of specialists. Network theorists tend to underestimate the role of ideas in policy change:

> "..the content of the ideas themselves, far from being mere smokescreens or rationalisations, are integral parts of decision-making in and around government.. ..both the substance of the ideas and political pressure are often important in moving some subjects into prominence and in keeping other subjects low on governmental agendas" (Kingdon 1995:127).

Other theorists have criticised the 'iron triangle' approach to policy networks for underestimating the role of specialists (Sabatier & Jenkins-Smith 1999:127) in policy processes, and their commitment to specific policy positions. It appears that the policy process is an important site for matching interests to ideas, and defining the interests of the state (Menahem 1998:287), but the way in which ideas are produced, refined and propagated is also very important in understanding policy continuity and change. The strength of Kingdon's theory is the concept of a community of specialists who develop and sustain a 'realm of ideas' subject to specific constraints, which are usually a required resource for developing and sustaining policy paradigms. Thus, while interest groups often define the *scope* for policymaking (what can be achieved politically), the community of specialists, often within the civil service, define the details of policy alternatives, and influence the selection of alternatives. Actual policy outcomes are thus significantly affected by the nature of this community: how well-resourced it is

(including expertise), and how well members of the community are integrated with political decision-makers.

The relationship between specialists and political actors is thus very important, and is subject to an important series of constraints arising from the different institutional roles of these actors. Because political actors do not have the capacity to evaluate specialist knowledge, its validity (and value) is generally established by its provenance: valid and valuable knowledge originates from, or is validated by, trusted specialists. Thus, the key question is how trust is established and sustained. March and Olsen characterise this trust as resting on three pillars; competence, reliability and irrelevance. Competence is "..what any professional would mean about technical competence in the field" (March & Olsen :1989:32); however, for the political actor this cannot be assessed directly, since they are not "in the field"; thus competence must be assessed by reputation, consistency and reliance on personal accounts from other political actors or trusted specialists ('expert' in March & Olsen's terminology). Reliability means "..the degree of congruence between the values and personal style of the expert and the values and personal style of the policymaker" (March/Olsen 1989:32); these are conditions both for trust and for effective communication. Irrelevance means the expert's lack of political ambition; if the specialist has political ambitions of his or her own, then the information is less trustworthy, since the specialist will be suspected of acting strategically in dispensing expertise. The problem of trust is easier to solve in a "homogeneous, relatively stable society" where policymakers and experts have very similar backgrounds and values; however, in a heterogeneous society, where there is a lack of consensus on values between politicians and specialists,

> "..it is possible that politically important groups (most conspicuously lower-status groups and non-establishment social movements) will have difficulty obtaining expert advice from competent advisors they trust" (March/Olsen 1989:32).

This problem has been restated in economic terms as the 'principal-agent problem' (Allison & Zelikow 1999:272), where politicians who have the formal responsibility of making a decision are 'principals', and expert advisors are 'agents' whose role is ideally "..an essentially mechanical instrument of the principal performing a desired function" (Allison & Zelikow 1999:272). The relevance of this problem to the current study is that it is obviously extremely important in rapidly-changing political environments, where the basis for trust between experts and politicians is significantly undermined, particularly in the event of regime change. This applies not only to non-governmental advisors, but also to specialists within the civil service, and even senior civil servants. In situations of political instability and polarisation, irrelevance and reliability are often conflated, since specialists with unacceptable political outlooks are often suspected of having political motivations in dispensing advice or advocating policy alternatives,

which imposes an important limitation on policymaking, and, particularly in a relatively technical area of policy, can deprive a new regime of a considerable fraction of the policy analysis skills available to it for policymaking. In terms of Kingdon's framework, the way in which the community of specialists selects, structures and packages policy alternatives can be profoundly affected by political change. One would therefore expect an important element of specialisation in a specific area of policy to include knowledge and experience of interaction within a specific political environment; a profound change in the political environment would thus potentially render expertise useless as *policy* expertise.

Organisational and Institutional Factors

A third and final element in the theoretical approach which will be taken in this study is the influence of institutional and organisational factors on policy change, a traditionally neglected avenue of exploration by policy theorists which has recently produced a wide range of influential work (Parsons 1997:223). The current study is concerned to a large extent with institutional and organisational innovation (the establishment of an energy policy function in government), and two closely related topics are discussed below: the development of institutional and organisational capacity, and the influence of organisational characteristics on policy change.

Institutional Capacity and Change

Whereas the concept of an organisation is not generally problematic, there is considerable confusion concerning the definition of institutions (Ostrom 1999:37). Here, Ostrom's definition will be adhered to, which is defined and elaborated as follows: institutions are

> "..the shared concepts used by humans in repetitive situations organised by rules, norms, and strategies. By *rules*, I mean shared prescriptions (must, must not and may) that are mutually understood and predictably enforced in particular situations by agents responsible for monitoring conduct and for imposing sanctions. By *norms*, I mean shared prescriptions that tend to be enforced by the participants themselves through internally and externally imposed costs and inducements. By *strategies*, I mean the regularised plans that individuals make within the structure of incentives produced by rules, norms and expectations of the likely behaviour of others in a situation affected by relevant physical and material conditions" (Ostrom 1999:37).

In this context, the specific concern is governance institutions, which regulate the activities of a sector of society characterised by its subjection to state attention in the form of policy activities. These institutions would include formal governance institutions embedded in various state agencies (and in unusual cases, non-state agencies), semi-formal arrangements between state

agencies and others, and informal arrangements between stakeholders sanctioned or tolerated by the state.

These institutions are generally embedded in specific organisational contexts. The relationship between organisations and institutions is considerably confused by the tendency for the terms to be used interchangeably[13]; in this context, institutions are defined as above, and organisations are defined as "..collections of human beings arranged systematically for harmonious or united action" (Allison & Zelikow 1999:145). Whereas organisations tend to be relatively well-defined, often have very clear criteria for membership, and are thus easy to identify, institutions are 'invisible' (Ostrom 1999:37-38). In almost all cases institutions exist within one or several (formal or informal) organisational contexts, and here we will assume that this is generally the case. Thus, organisations comprise sites where institutions are *actualised, sustained and elaborated.*

There is a direct relationship between the success of institutional innovations and the creation of appropriate organisational contexts to implement these. The ability of societies to do this can be termed a society's 'institutional capacity', which consists of 'institutional resources' in the form of existing institutions and the corresponding organisational capacity. There is also an important distinction between a society's institutional resources and those of the state, which form a subset of the former. Institutional resources are comprised of organisational structures and routines which provide the required information, accumulate practical and specialised experience, and maintain appropriate relationships. The development of completely novel institutions thus involves a period of uncertainty while these capacities are developed, which might involve a period of years. Successful institutional innovation is usually based on existing institutional resources which have been successfully recombined into new institutional structures to meet new challenges (March & Olsen 1989; Skocpol & Finegold 1982); this is cogently illustrated by March and Olsen in a discussion of the development of new institutions to promote the development of, and regulate, the oil industry in Norway after the discovery of oilfields in the North Sea.

Generally, oil discoveries have not furthered the national development of states: on the contrary,

> "..oil discoveries and their exploitation have created new power and dependency relations, social distortions, cost pressures, inflation, migration, and deindustrialisation, despite the express intention of authorities to avoid such developments" (March & Olsen 1989:35).

In fact, most small countries have found it extremely difficult to benefit from the discovery of oil, and, rather than direct the resulting wealth to national development, have experienced (in

[13] Compare for instance, March's work on organisations with Simon (1967), and his later work with Olsen on institutions (1989, 1994), which have a similar scope.

many cases, severe) disruption to their economies and their political and social systems. After the discovery of oil in the North Sea, Norway was an exception to this rule; the Norwegian state managed to develop and inaugurate a successful set of new institutions to promote and regulate the emerging oil industry so that it furthered national goals and avoided negative outcomes commonly associated with oil exploitation.

In a study to determine the reason for this, Olsen concluded that the new institutional arrangements deployed by the Norwegian state were in fact based very closely on pre-existing arrangements for regulating electricity, shipping and labour. Relationships with multinational oil companies active in the Norwegian oil fields were institutionalised along similar lines to those with foreign companies which had been involved in the development of hydroelectricity resources earlier in the century (March & Olsen 1989:36-37). An additional significant factor was the decision-making process, which was primarily based on the deployment of existing routines rather than on a rationalist cost-benefit analysis (March & Olsen 1989:36), which suggests not only that existing institutional resources were widely used in developing a new institutional environment, but that older institutions also altered the way in which state agencies understood the challenge itself, and influenced the decision-making process accordingly. There is a further element which is missing from the above example, which is the way in which the Norwegian state successfully accomplished a relatively high degree of co-ordination between different elements in the new institutional dispensation.

This case study suggests a few useful relationships between policy change and institutional resources. First, it suggests that when the state develops policies for institutional reform, both policy choices and outcomes are influenced by existing institutional resources available to the state. Second, inadequate institutional resources would hinder the state's ability to make and implement successful policy for institutional innovation; thus, a) the nature of policy change involving institutional reform can be partly explained by the availability of institutional resources, and b) the success or failure of policies involving institutional change can be partly explained by the lack of available institutional resources. Why this is the case, as well as a more detailed elaboration on the way in which these processes function will be discussed in more detail below.

Organisations and Policy Change

Government decisions, including policy decisions, are also a form of organisational output (Allison & Zelikow 1999:143, 164), since in almost all cases, policy is developed within an organisational context. The resources available to governments for both policymaking and implementation are produced by organisations of various kinds; this organisational context

creates certain capacities and imposes certain limitations which have a significant impact on both policy formulation and implementation.

The basic motivation for creating organisations is to accomplish tasks collectively which would be difficult to accomplish individually, due both to the limitations of individuals and to the complexity of tasks. Organisations are thus structured systematically to undertake a complex series of tasks, for which specialisations and routines are developed, through which various organisational capabilities are established. Thus, organisations are "less analogous to an individual than to a technology or *bundle of technologies*" (Allison & Zelikow 1999:146), a collection of routines and skills which give the organisation various capabilities (March & Olsen 1989:24). These are termed 'Standard Operating Procedures' or SOPs, by Allison and Zelikow (1999:147-8).

SOPs comprise a combination of experience, specialist knowledge and routines for gaining information and task execution, and require a consistent supply of resources to develop. While these SOPs enable an organisation to respond to a range of challenges, the repertoire of available SOPs also impacts on the way that a specific organisation responds to novel situations:

> "..a programme, i.e. a complex cluster of SOP's, is rarely tailored to the specific situation in which it is executed. Rather, it is (at best) the most appropriate of the programmes in the existing repertoire" (Allison & Zelikow 1999:178)

Two other related effects are important. The first concerns the establishment of organisational goals; since many organisations have what March and Simon refer to as 'non-operational goals' (March & Simon 1967:156), such as 'enhancing energy security', organisations derive sets of 'operational goals', with clear quantifiable ends, such as 'increasing local production of energy carriers', which become the main focus of the organisation's activity. The second is the development of 'organisational culture', a set of beliefs concerning the function of the organisation, proper procedures for accomplishing tasks and responding to challenges, and criteria held within the organisation for success and failure (Allison & Zelikow 1999:153).

In the policy environment, in most cases the key organisations in both policymaking and implementation are state agencies, and particularly the civil service (government departments). The way in which government departments influence policy outcomes is related to their role in the policy process; although they seem to exercise little control over the policy agenda, they seem to have a major influence on the short-list of policy alternatives from which policy-makers choose policies (Kingdon 1995:30-32); whereas policy agendas specify problems which should be addressed, viable policy alternatives consist of far more detailed potential programmes. This is the context for two ways in which organisational factors influence policy outcomes.

The first is that both policy choice and implementation are influenced by the existing capabilities of state agencies; if these form part of a policy alternative, it is more likely that the alternative will be chosen. The reasons for this are that a) the capability exists and does not have to be created (which would consume more resources and destabilise existing inter- and intra-agency relationships), b) the outcome is more predictable (and less likely to fail), c), more accurate and detailed information is available, and d) the state agency in question is frequently also the key policymaking agency (Allison & Zelikow 1999:176-177). This is also the basis for Lindblom's theory of 'incrementalism' (Lindblom 1959), which proposes that 'incremental' policy changes are most likely, for the same reasons. Implementation is likely to be influenced in the same way, since capabilities required by new policy programmes will largely be derived from existing organisational capabilities. The second factor is organisational culture, which is closely related to existing organisational capabilities, and defines the scope and the style of likely policy alternatives to be advocated by an organisation. For instance, in South Africa in the 1970s, when coal policy was being reconceptualised, the engineering-based culture of the Department of Mines favoured supply-based policies based on massive increases in productive capacity, whereas the resource planning-based culture of the Department of Planning favoured conservation policies.

The concept of actualisation introduced above can be considerably elaborated in organisational terms. As outlined above, a high degree of policy actualisation involves three things: a) a high level of ongoing policy activity, b) a high level of resources dedicated to implementation and further policymaking in the same area, and c) that the policy has been matched with appropriate implementation capacities. Thus, actualisation is a measure of the degree to which policies 'take root' in an organisational context. Since state agencies have a central role in policymaking and in implementation, there is an internal link, as mentioned above, between conditions a) to c) above. Organisational capacity for policymaking will be strongest in areas where organisational capacity already exists for implementation, and resource flows have already been established. Departure from existing organisational capacity will thus pose a significant risk for the state, as well as require a commitment to provide further resources and political support; meanwhile new organisational capacity will initially be weak and subject to multiple pressures from hostile agencies and stakeholders, and lack the complex combination of experience of specific institutional arrangements and detailed knowledge of implementation available in more familiar areas of activity. The ability to elaborate further policy adjustments is also closely linked with detailed operational knowledge linked to a specific organisational capacity.

By way of example, Skocpol and Finegold's paper (1982) on New Deal programmes is instructive. The authors compare two policy initiatives aimed at mitigating the impact of the

Great Depression: the National Industrial Recovery Act, and the Agricultural Adjustment Act. Whereas the second was based on "..a long process of institution building whose roots go back to the Civil War" (Skocpol & Finegold 1982:275), and was relatively successful, there was very little institutional precedent (or organisational capacity) for the first (which was mainly concerned with economic planning) except war-time contingency planning. As a result, implementation of NIRA "..simply exceeded the grasp that could be afforded by the public institutions and intelligence of the day" (Skocpol & Finegold 1982:278), and the NIRA did not achieve its objectives. The different outcomes were ascribed by the authors to a number of key organisational factors. In the case of the agricultural programme, existing institutions and organisational capacities created an "administrative will to intervene" based on a combination of a strong organisational culture, professional skills and an "orientation to practical action", as well as

> "a process of 'political learning' about what could be effectively done for farmers and society as a whole through public agricultural policy" (Skocpol & Finegold 1982:276).

After Heclo, the authors distinguish between the "occasion for new policy" and "what to do", the actual specification of policy alternatives; whereas the former arises from policy crises, interest group pressure or broader political change, the latter

> "..tend to come from government administrators and other expert elites who have been closely in touch over time with attempts and failures in a given field of public-policy endeavour.." (Skocpol & Finegold 1982:276),

which strongly echoes Kingdon's finding on the distinction between the influence of stakeholders and the influence of communities of specialists on the policy process: stakeholders tend to influence the problem agenda, whereas specialists tend to influence the policy alternatives agenda . Amending or extending the state's power through the formalisation of new institutional arrangements thus rests more on available organisational resources than the formal aspects of the institutions themselves:

> "Even successful increases in administrative power have had as their basis less the ability to issue authoritative commands than the capacity to draw upon administrative resources of information, analysis, and expertise for new policy lessons and appropriate conclusions on increasingly complex issues." (Heclo, quoted in Skocpol & Finegold 1982:277)

Thus, both policy activity (including the specification of further policy alternatives) and the actualisation of policies is significantly enabled and inhibited in different ways by the scope of existing organisational resources, in a way which is not explained by policy networks frameworks, which tend to assume that strategic requirements (for specific policy alternatives) imply their existence. In policy environments with severe resource constraints (such as developing countries), these factors become even more influential on policy outcomes.

Conclusion

Three different approaches have been outlined above for approaching the analysis of the development of South African energy policy, encompassing policy networks, the 'multiple streams' framework, and institutional and organisational factors. While there are difficulties in attempting to relate these frameworks theoretically, there are some useful ways in which these complement each other, which are worth highlighting.

The core methodological approach will be based on the concept of policy communities and policy paradigms; in terms of the above discussion, policy communities will be identified empirically in terms of five criteria:

- there is some form of policy-related interaction between the actors who form part of the community
- there is an exchange of resources between members, but particularly between legitimate state policy agencies and stakeholders
- there is a common commitment to a policy paradigm
- the community is successful in preventing the 'politicisation' of policy problems
- the community has a decisive influence on the policymaking environment

As referred to above, this approach alone, although very powerful in explaining the context for policy continuity and change, has some limitations. Some of these are 'blind spots' in the policy environment which are simply not addressed by policy networks theories, and others are aspects of the policy environment which are not well-elaborated by this approach.

The aspects of the policy process which are better elaborated by the other two approaches include Kingdon's exploration of policy crises, which provides a more detailed and subtle account of the conditions under which a 'focusing event' or other crisis might challenge the policy *status quo*, and also his exploration of the problem agenda, and the way in which problems appear and disappear from the agenda. Finally, more insight is provided by Kingdon's framework into the conditions in which a policy community's influence over the policy process might be weakened or abolished, both as a result of crises, but also other factors in the 'political' stream, such as changes in leadership and changes in the 'national mood'.

Aspects which are not well-addressed, or not addressed at all by the policy networks approach are encompassed by the more subtle insights from both Kingdon and new institutionalists concerning distinctions between the roles and influence of different types of actors within the policy environment. The emphasis on strategic interaction by network theorists underestimates the role of specialists, and the impact of the organisational and institutional environment on policy outcomes. The most important distinction made both by Kingdon, and by Skocpol and

Finegold, is between a 'problem agenda', which tends to be significantly influenced by stakeholders, and a 'policy alternatives agenda', which tends to be more influenced by communities of specialists, which undertake detailed specification of policy alternatives. This process is promoted and/or limited by the organisational and institutional context and available resources, which are very significant factors in determining alternative specification, policy choice, and implementation. Having applied these three frameworks to the understanding of the material in the following five chapters, their relative contributions will be discussed in more concrete terms in the Conclusion.

What follows below is an outline for the methodological approach which will be taken in the rest of the study. The first process which was undertaken was an identification of relevant data, which was done in terms of the three frameworks outlined above, and a subsidiary framework for classifying energy policy paradigms developed in the next chapter, which played an important part in making decisions about the historical and conceptual *scope* of the study. Research on the history of South African energy policy is almost entirely lacking, with the notable exceptions of Hofmänner (2002) and Steyn (2001); as a result, much of the data was gleaned from primary sources, including interviews with senior officials who had been involved in energy-related organisations, annual reports, legislation, commissions of inquiry and media reports. Historical data on energy production and consumption is highly aggregated and probably inaccurate; however, data which has been used below has primarily been sourced from the Department of Minerals and Energy and Eskom.

The actual analysis was organised according to the outcome of an initial survey of the key areas of energy policy-related activity in the South African state. There were five main areas of policy activity. Three of these formed the core of the energy supply industry in South Africa: coal, electricity and liquid fuels. The fourth, nuclear energy, was included because of the significant resources devoted to its development in South Africa and because of the policy proposals for a large nuclear power programme made in the 1970s, and the fifth consisted of a review of the overall development of energy policy institutions and decision-making processes, into which policymakers attempted to integrate the previous four areas of policy activity with varying degrees of success. Other areas of policy activity were either omitted or dealt with in one of the five areas above, because of their lesser importance as sustained areas of policy activity. Lesser supply sectors, such as gas and renewable energy, were not included (except in passing) due to the lack of policy activity and outcomes during the period of the study – significant policy developments took place in both areas after the period surveyed here. Demand-side policies were not surveyed except in passing due to their almost complete absence from South African energy policy in the study period. There are two other areas of policy activity conspicuous by their

absence. The first is environmental policy, which has not been included as a separate section, again on account of the lack of significant energy policy-related environmental policy initiatives during the period studied, and the second is household energy provision for the poor. This issue was ignored by apartheid energy bureaucrats until the late 1980s; what followed was a period of significant research (mainly by outside agencies) into the complexities of energy poverty. However, the complex approach to policymaking in this area which was emerging in the Department of Minerals and Energy Affairs in the mid-1990s was subsumed by the success of the electrification programme, and policy on energy poverty largely 'collapsed' into electrification policy. This has been briefly discussed in the last chapter, but will be the subject of future research.

Chapter 2

The Structure and Context of South African and International Energy Policy

Introduction

Energy as a unifying concept in physics emerged only in the mid-19th century. The emergence of energy policy as a preoccupation of governments is a relatively recent phenomenon, which began in the post-war era as an outcome of the development of techno-economic systems within which energy carriers were substitutable. This development created new possibilities for state intervention in national energy systems; new institutions were introduced, and strategies were developed to replace more traditional energy carriers such as coal with cheap crude oil.

The 1973 oil crisis put an end to this trend, as countries developed new and more elaborate energy policy institutions under the guidance of the newly-established International Energy Agency to partially reverse this process and 'de-oil' their economies. Additional problems, such as the emerging environmental crisis, posed further challenges to existing energy policies, culminating in international negotiations on global warming at the end of the century. Developing countries faced further complications in the challenges posed by energy poverty, lack of energy infrastructure and capital, and the declining quality of their physical environments.

The development of energy policy by various governments in response to these challenges can be usefully categorised into a series of 'energy policy paradigms', which are characterised by a central set of concepts, a scope of influence, characteristic types of institutions, and a repertoire of problems and corresponding solutions, as mentioned in the previous chapter. Against this background, the South African energy system developed with some unique features which, it will be argued below, were a key factor in the way that energy policy-related institutions developed. These developments outlined above will be discussed in detail below as a prelude to the main analyses following in the subsequent chapters.

The Energy Concept

The Dictionary of the History of Science (1983:122) identifies three traditions which combined in the development of the physical concept of energy in the 19th century. The first concerned the conservation of a '*vis viva*' in motion, which was indicated by the damage a moving object could do, or the extent it could displace an object it collided with. The second involved a "correlation of forces" in 18th-century theories of "a single universal fluid responsible for the phenomena of heat, light, electricity and magnetism", which developed with discoveries of the battery and the properties of magnetism and induction. The third tradition came from engineering:

> "..the steam engine offered an every-day example of the equivalence of chemical affinity, heat and mechanical work" (*The Dictionary of the History of Science* 1983:122).

Carnot posited an 'imponderable fluid calorific', which flowed unhindered from coal to heat to motion, which conflicted with Joule's work on efficiency of electric motors, which inherently involved a hindrance of some kind in the translation of electric current to motion. The resolution of this conflict led to the formulation of the two laws of thermodynamics (*The Dictionary of the History of Science* 1983:122).

The development of the energy concept, related so directly to the development of new industrial technologies, foreshadowed the deployment of the concept in the economic, social and political realms in a far narrower sense. While states had been concerned for centuries with the supply of energy carriers such as wood, charcoal, and even coal, these had not been distinguished from other types of commodities. The industrial revolution, with its increasingly centralised and mechanised modes of production, was based largely on a steep rise in energy intensity; whereas a few proto-industrial enterprises such as ceramics and metallurgy had required high energy intensities, this was by the 19th century an almost universal requirement for production. The requirement for high energy intensity spread from productive processes to almost all other societal processes as societies industrialised.

As a result, a class of industries developed which specialised in supplying 'energy carriers', commodities which could be converted into useful energy by contemporary technologies. Initially these industries developed through the commodification of pre-industrial energy carriers such as coal and charcoal, but technological developments led to the emergence of a new generation of industries such as gas, electricity and liquid fuels producers and distributors. What was initially a succession of energy technologies (for instance, wood→coal), diversified with the development and proliferation of energy technologies into a complex network of substitutability; thus, electricity could be generated from wood, coal, gas, liquid fuels or water; electricity could be used for space heating, as could gas or wood, etc. This led initially to a series of quasi-energy terminology reflecting this substitutability (fuel, power), and by the mid-20th century, the term

'energy' itself implied a class of commodities which were bought, sold and delivered by the 'energy industries'. This conceptual development created the basic conditions for the emergence of energy policy in the latter half of the 20th century.

The Emergence and Development of Energy Policy

Energy Policy developed internationally in several phases. The first phase (which will be termed 'proto-energy policy' and constitutes the pre-history of energy policy proper) from the development of modern energy industries during the 19th century to the 1940s, saw the emergence of state interest in energy supply[14] and the emergence of regulatory institutions in individual supply sectors; from the 1950s onwards, rapid economic growth, shortage of energy supplies, and a more thorough integration of energy supply technologies led to a new form of state interest in the energy sector in general, and policy and institutions were for the first time developed on the basis of the energy sector as a whole. The next phase was heralded by the oil crisis in 1973, and again in 1979, which highlighted severe shortcomings in energy policy amongst OECD countries. This led to the establishment of the International Energy Agency, and increased state interest and involvement in the energy sector. The oil crises, coupled with several waves of environmental crises, led to significant conceptual and institutional innovations in energy policy. The problem of climate change currently poses another serious challenge.

The three phases of energy policy development considered above can be considered in terms of three related dimensions: *conceptual developments*, which specified the scope of energy policy as well as the conceptual framework within which it operated; *institutional developments*, which constituted the sorts of institutions set up by the state to implement energy policies; and *technological developments*, which provided the material conditions which formed the background against which the first two dimensions developed. Below, the three phases outlined above will be discussed in detail.

The Development of Proto-Energy Policy

The significance of the immediate pre-history of energy policy lies in the nature of the decision-making processes and associated institutions which were inherited by and integrated into the first phase of development of the energy policy project. Since this phase (see below) was concerned only with energy supply and not with broader issues, the current section will focus only on the relevant features of the pre-energy policy decision-making processes and institutions of the energy supply industries.

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[14] There were also a number of scattered instances of pre-modern states developing policies on the supply of energy carriers such as wood or coal – see for instance Debeir, Deléage & Hémery (1991).

These industries developed in several waves, beginning with the proto-industrial development of the coal industry, particularly in the UK and China, based for the first time on the supply of an energy carrier with a relatively high calorific value to emerging urban areas, and to industrial processes which required a high degree of energy intensity. Other industries followed: notably the coal gas industry at the beginning of the 19th century, the oil industry from the mid-19th century and the electricity industry towards the end of the 19th century (Patterson 1991:22-23), with others such as the nuclear industry following during the 20th century.

These industries had a number of characteristics in common. All of them were capital intensive, and required long lead times for increasing productive capacity, which led to the establishment of a set of planning processes based on predicted demand growth. Since demand for these commodities grew at the rate of, or faster than, national economies, demand forecasts were relatively simple. In addition, a process of continual technological improvement which constantly increased the most efficient plant size encouraged economies of scale, a trend which was reinforced by the continuous expansion of the energy system. The vertical integration of energy supply companies created large oligopolies or monopolies, which were the subject of ground-breaking anti-trust legislation in the 1920s.

This trend was enhanced by state responses to the institutional challenges posed by the network industries such as gas and electricity, which constituted natural monopolies. In most cases, the problem was resolved by granting exclusive access (a legal monopoly) in a specific geographical area to one firm. The growth in economies of scale, and the concomitant development of regional distribution systems, reduced the number of these firms to a handful or only one. In some cases, states opted to create national state-owned utilities. These monopolies were regulated in various ways: prices were set, technical standards were established, and obligations to supply any consumer within a licensed area were established.

The obligation to supply was an outcome both of the monopoly status of network industries and of the requirement that energy industries provide a continuous supply of energy carriers, given the growing importance of energy supply in industrial economies. While aggregate demand was not difficult to forecast, short-term demand was unpredictable, and obligations to supply combined with a technology-based organisational culture created a planning culture which privileged the responsibility to supply over most other considerations:

> "This responsibility became fundamental to the outlook of gas and electricity suppliers, and coloured their approach to forecasting and planning. Under their influence, the consequent assumptions in due course carried over to 'energy planning' in general" (Patterson 1991:59-60)

These planning processes were inevitably based within the energy supply industries. State interest in the industries, and the corresponding policy activity, corresponded to three areas.

The first was security of supply, which interested the state for two reasons: first, as mentioned above, the growing importance to national economies of the energy industries, particularly the electricity industry which by its nature was more vulnerable to disruption than others; second, the strategic nature of oil supplies in particular, underpinned by the switch to oil by navies during the first world war, and the strategic role of oil supplies during the second world war, which contributed decisively to the defeat of the Axis powers.

The second was the area of natural resource policy, which encompassed all primary energy sources in use at the time. The primary area of policy was mining, which covered the extraction of fossil fuels, but there were also substantial institutional arrangements and policies established for the regulation of hydroelectric resources, and in some countries (for example Sweden) for wood use. Regulation and promotion of natural resources for energy use was a subset of more general regulation and promotion of natural resource use.

The third was national industrial development: energy industries were classed as 'infrastructure industries', a group of industries including telecommunications, transport and others which provided essential inputs to other economic activities. Since there appeared to be a direct correlation between economic growth and the growth in services provided by these industries, bottlenecks to economic growth could only be avoided by promoting their adequate growth. Thus, infrastructure industries were granted a special status in economic growth strategies, first in the industrialised countries, and then in the developing world through the influence of organisations such as the World Bank.

Thus, to conclude, during this phase a unified conceptual approach to energy policy had not yet emerged, and the development of both energy supply and energy use technologies occurred as part of the general development of the economy. However, apart from general industrial policies, energy supply industries were commonly subjected to three areas of policy. The first was the promotion of and regulation of network industries as natural monopolies; the second was natural resource policy, where institutions for the promotion and regulation of natural resource use were developed; and the third was the promotion by the state of 'infrastructure industries', which included the energy industries. Decision-making concerning the regulation and expansion of energy supplies was confined to a) the firms themselves, which instituted internal planning processes based on demand projections, and b) government departments corresponding to individual industries in one of the categories above; there was no conceptual or institutional integration between decision-making processes in different energy supply industries.

The Inauguration of Energy Policy

The origins of energy policy *per se* as a state activity lie in the 1950s and the 1960s. By the late 1970s, almost all countries had adopted the conceptual vocabulary of energy policy. As Lönnroth observed in the 1970s concerning the emergence of Swedish energy policy:

> "..energy as a *gestalt* is fairly new. It emerged during the 1950s. Earlier Sweden did not have an energy policy but an electricity policy, a fuels policy, and so forth" (Lönnroth 1978:268).

Lönnroth implies two simultaneous processes at work: the first was the integration of existing strands of policy pertaining to the energy supply industry, and the second was the development of a new conceptual framework which would delimit both the new policy domain and the state's involvement in it. This was brought about by a combination of two developments.

The first was the increasing convergence of energy systems. Whereas before, energy carriers had displaced one another in a sequence of technological improvements (for instance, lighting improved from candles to paraffin lamps to gas lamps to electricity), by the 1950s the same energy service could be delivered by a number of different energy carrier-technology combinations. The development of energy conversion and distribution technologies also rendered the relationship between energy carriers and energy services more complex, since, for instance, gas could be used to generate electricity, or compete directly with electricity to heat space. However, the relationship between energy carriers and end-use technology simultaneously became more specialised, increasing the transaction cost of switching energy supply for a particular application. Thus, many more configurations of the energy system were possible, but commitment to a specific configuration involved long-term sunk costs. This in turn implied that the market in energy carriers would not necessarily produce the 'optimum' configuration, and thus the achievement of such a configuration would require intervention by policymakers, who might also wish to attain non-economic objectives (for instance, security of supply). These developments provided the conceptual and the economic basis for an integrated approach by the state to the energy supply industries.

On a conceptual level, a 'proto-energy policy' vocabulary had developed during the early part of the 20th century. Energy carriers associated with combustion-based end-use technology, in a technological sequence from wood through coal to oil and gas, were collectively referred to as 'fuel', whereas electricity, which was based on motive power, was classified separately as 'power'. The convergence of these concepts as 'energy' was accompanied by the development of the collective term, the 'energy sector', to describe the part of the economy inhabited by the energy supply industries, which in turn defined the domain of the newly-emerged area of policy activity.

An example of this convergence is discussed in a case study of the origins of Swedish energy policy by Lönnroth; whereas 'electricity policy' and 'fuels policy' had previously been autonomous, the "rather rapid merging of the fuel issue and the electricity issue into an energy issue" in Sweden in the 1950s was precipitated by the possibility of nuclear energy providing both district heating and electricity (traditionally electricity policy), oil-fired plants potentially doing the same (traditionally fuels policy), and low electricity prices making electricity a possible source of space heating; thus

> "..electricity and fuel became one energy issue because of technological change that held out the possibility of merging two hitherto separate supply systems that made electricity economically competitive with fuel for space heating" (Lönnroth 1978:268-269).

The second development which precipitated the emergence of energy policy was the series of energy supply crises in the 1950s and 1960s in many industrialised countries at a time of unparalleled economic growth, which were caused by swiftly rising demand. These recurrent energy shortages served as 'focusing events' which, given the conceptual and technological changes mentioned above, highlighted the crises not as coal shortages (which many of these were) or electricity shortages, but as 'energy shortages', a consciousness which was partly brought about by the rapid substitution of oil for coal after the second world war, and which partly accelerated this trend in the following decades. There were three interrelated outcomes.

The first of these was the rapid penetration of oil as the key primary energy source for most industrialised countries in the period from 1950 to 1973; at the same time, oil-producing countries emerged as major sites of strategic conflict, and newly-independent developing countries built their energy infrastructure on cheap oil. The initial impetus for the oil revolution was the inelasticity of coal production, which could not keep up with demand when traditionally coal-dependent western European economies began to rebuild themselves after the war, as well as a shortage of electricity generation plant. Oil production by contrast was far more elastic, and oil-fired electricity plant had far shorter lead times.

In addition, there was a complex synergy between the growth of the refining industry, the motor industry, road-building, petrochemicals and electricity generation, which utilised a considerable supply of fuel oil as a low-value by-product[15] of refining (Saumon & Puiseux 1978:130). The

[15] Petrol and diesel have not proved to be substitutable during the 20th century for powering motorcycles, cars, and larger vehicles, the only alternative being another transport mode such as electric trams or trains. Crude oil consists of molecules comprising different lengths of hydrocarbon 'chains', and refining involves the separation of these chains into aggregate fractions; the lighter fractions are high-value products such as gasoline/petrol, LPG, diesel and paraffin/kerosene, whereas the heavier fractions are low-value products such as fuel oil and tar. Thus, since the requirement for petrol and diesel in the short and medium term has been relatively inelastic, this has necessitated the production of lower-value by-products easily able to compete with coal on convenience and price for ships' bunkers and industrial power applications (other than in South Africa), including electricity generation. Earlier refineries produced only relatively small amounts of high-value product per barrel of oil by comparison to later more complex refineries, leaving a large residue of low-value fuel oil.

development of 'dynamic' industrial complexes such as these was intimately related to the ascendancy of oil:

> "Dynamic industries, like motor cars and petrochemicals, were linked with oil products. Their growth produced increased demand for oil. Transition to oil was both the result of economic growth, induced by dynamic industries, and at the core of economic growth." (de Oliveira & Girod 1990:530)

Added to this, the extremely low and stable price of oil in the 1950s and 1960s entrenched a growing dependence on oil in almost all countries. For instance, crude oil rose from 25% to 66% of French primary energy consumption between 1954 and 1974; the UK, with significant domestic coal reserves, increased its crude oil dependence from 10% of primary energy in 1950 to 46% in 1973. Other countries were similarly affected, including the US, which had been a major net oil exporter; domestic demand had significantly outstripped supply by 1973 (Saumon & Puiseux 1978:123, Chesshire et al. 1978:38). Thus, primary energy consumption of industrialised countries shifted between 1925 and 1972 from "an overwhelming dependence (over 80%) on coal to a predominant reliance (around 70%) on oil and natural gas" (Goldemberg et al. 1988:5). This trend was accelerated by environmental concerns related to coal production and consumption, and by 1973, the world coal industry was in decline.

The second outcome was the development of energy planning systems, the goal of which was

> "..to correctly forecast energy demand and promote the necessary increase in supply that will make it possible to satisfy this demand.." (de Oliveira & Girod 1990:530)

The basis for this planning approach was the energy sector, the cluster of energy supply industries which constituted the only site of state intervention envisaged in this phase of energy policy development. Energy demand was not at this stage considered a site for state intervention; thus energy policy was based on fulfilling demand at the lowest possible cost to society. Thus

> "..the expected future energy system is no more than an extrapolation of current trends" (de Oliveira & Girod 1990:530).

As Girod and de Oliveira put it, in this approach,

> "..there is no place for major structural changes that would introduce a breakdown in the energy-society relationship.." (de Oliveira & Girod 1990:530).

In other words, this initial approach to energy policy was defined in narrow parameters which did not foresee any significant structural change to the energy system, or any variance in the stable demand growth patterns exhibited since the second world war. In the relatively stable conditions of the post-war period, these assumptions held relatively well.

The progression from the previous phase was clear in the form that this phase assumed. Institutions for planning expansion of the energy industries were simply augmented by the new decision-making processes, which were based on the same premises. There were two basic

energy policy problems which were addressed in this phase. The first was the problem of security of supply, which was primarily threatened by a lack of sufficient growth in the output of the energy sector. The second problem was the promotion of least-cost energy solutions, which involved the substitution of oil for coal, and later natural gas and nuclear energy (de Oliveira & Girod 1990:530). Energy planning in this phase was thus simply a generalisation of planning institutions developed in individual supply sectors, coupled with various forms of influence on the development of future energy supplies. Given the phenomenal growth in primary energy consumption over this period, in order to achieve this latter objective, energy policies were not required to bring about significant structural change in the energy system, but merely to augment the influence of existing economic forces in the growth of the energy system.

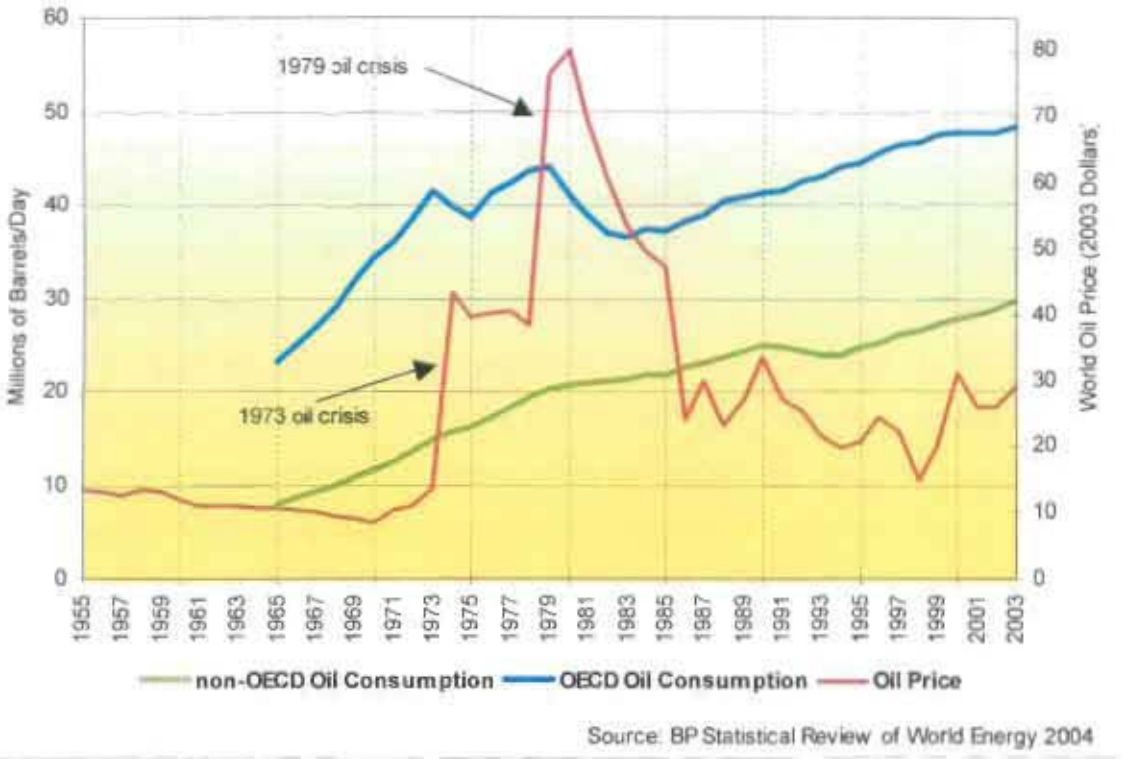
To conclude, the emergence of energy policy heralded the creation of new conceptual frameworks and a new form of planning (energy planning), which created a basis for state intervention in the energy sector as a whole. Planning and policies were based entirely on supply-side measures, engaging only with the energy supply industries, rather than with the energy system more broadly.

The 1973 Oil Crisis and the Broadening of Energy Policy

The 1973 oil crisis heralded the third phase in the development of energy policy internationally. The crisis itself consisted of three components: an effective challenge to the international oil production system by key producer nations (OPEC), which involved a wave of nationalisation and an end to the dominant role of multinational oil companies based in the US and Europe in setting prices and production; a concomitant rise in prices imposed by producers; and finally an oil embargo imposed by Arab members of OPEC against perceived supporters of Israel in the 1973 Arab-Israeli conflict (Yergin 1992:596). The impact of these combined events was to push the price of oil up by around four times, and impose restrictions on supplies for the period of the embargo (about 5 months). Whereas there had been previous oil supply crises during the 1950s and 1960s (notably the during the Suez crisis in the 1950s), the 1973 crisis had a profound systemic effect on the global economy, due to two factors: the first was the level of dependence on cheap oil achieved by the world economy, and by the OECD countries in particular, and the second was the fact that although the US was one of the largest oil producers, which had been able to boost output in previous crises in response to shortages, by the 1970s the US had become a net importer of oil.

The 1979 oil crisis, precipitated by the Iranian revolution and the overthrow of the Shah (and the almost complete disruption of Iranian oil production), caused a similar spike in world oil prices,

Figure 2.1:World Oil Price and World Oil Consumption



Source: BP Statistical Review of World Energy 2004

this time because of a real shortage in supply. Figure 2.1 above indicates the impact of the crises on the real oil price, as well as OECD and world oil demand.

The graph indicates a number of interesting trends. First, the stable and slowly declining price of oil in the 1950s and 1960s, which was the basis for the switch in most national energy systems away from coal towards oil. Second, the dominance of OECD countries as oil consumers, and third, the periods following the oil crises, where a significant decline in oil consumption took place; the lack of such a deviation in non-OECD countries' oil consumption mainly reflects the relative economic independence of the Western and Eastern Blocs during the Cold War. Whereas growth in oil demand was rapid before the 1973 crisis, demand declined for two years afterwards, and reassumed a relatively rapid growth until the 1979 crisis. After the 1979 oil crisis, oil consumption declined for a longer period, and began to grow again more slowly; the reason for this longer period of decline and the slower growth of consumption was a structural change in energy systems, particularly in OECD countries. There were two main causes of this shift: first, a natural economic shift to other energy carriers as a result of the increased price of oil, and second, internationally co-ordinated efforts to develop and implement energy policies to reduce dependence on oil.

The two oil crises in the 1970s were thus linked to structural features of the energy systems of national energy systems, and the OECD countries in particular:

> "The OECD countries have paid dearly for their voracious oil appetite, developed when oil was cheap. Between 1973 and 1981 these countries paid about 1.5 trillion dollars (1984 $)

> more for their oil imports than they would have paid had the oil price remained at the 1972 level. This expenditure, equivalent to one-sixth of aggregate GDP of OECD countries in 1980, resulted in a loss of purchasing power for other goods and services, and was a major contributor to the 1970s phenomenon of 'stagflation" (Goldemberg et al 1988:10).

The effect on developing countries was more marked, causing massive balance-of-payments problems and in many cases rampant inflation and economic depression. The crises thus served as 'focusing events' for a change in energy policy paradigm, which included conceptual and institutional frameworks, as well as the *scope* of policy. Many of the challenges posed by the structural problem of the oil crises could not be addressed by limiting the scope of analysis of energy problems only to the energy sector without increasing the risk of further supply crises. This was reinforced by other less immediate problems such as various forms of environmental problems, which were not easily addressed in terms of the existing approach to energy policy alone. Whereas 'energy' had previous implied the energy supply industries, it now became the expression of a more complex set of societal interactions. Lindberg (1978) differentiates between post-war policies emphasising supply sectors only, and post-1973 policies extending to the energy system as a whole[16]:

> "Post-war energy shortages led to the policy objective of expanding coal supply. This objective was subsequently extended to incorporate petroleum and nuclear energy as the potential of these resources became obvious.. ..nations then attempted to develop coordinated fuel supply policies covering research and development allocations, pricing policies, and the like.." (Lindberg 1978:9)

The 1973 crisis, however, redefined 'energy policy', and elevated it to a more fundamental status:

> "..with the 1973 boycott the policy boundary was suddenly expanded again to energy – a concept implicitly incorporating demand and international and security dimensions and leading to a new and complex set of tradeoffs. The economic price that ensued rapidly forced upon one and all the realization that energy policy has profound implications for price, employment, and economic growth policy. Awareness of higher prices, impending shortages and continued international vulnerability now began to highlight the extent to which energy policy is inseparable from development policy writ large and from the evolution of economic and political structures, cultures, lifestyles, the human and the natural environment at national and international levels." (Lindberg 1978:9)

Whereas post-war energy policy was aimed at optimising energy supply to the economy, the 1973 crisis indicated a deeper structural crisis, and required a broader assessment of the 'energy system' as a whole, not only the energy sector (de Oliveira & Girod 1990:531); whereas the pre-

[16] Lindberg applies the expression 'fuel policies' to cover energy policies limited to the supply sector, and 'energy polices' to indicate a far broader approach, which highlights the complexity of energy policy vocabulary.

1973 basis for energy policy had been the energy sector, a growing awareness developed of a broader context for energy policy, the 'energy system', a societal subsystem which, unlike the energy sector, was not a subset of the formal economy, but embraced a far wider range of energy transactions or energy 'flows', from production to end-use; the path along which energy flowed between various conversion technologies was referred to as an 'energy chain'. Energy flows could thus be traced through the energy system, from power plant to toaster or hot water-bottle, through a series of energy conversion and transport technologies; coal was mined, burned to produce heat, heat produced steam, which drove a turbine to produce electricity, which was transmitted through a network to a household, where electricity was converted to heat by a kettle, which boiled water for a hot water bottle, which is a technology for storing and slowly releasing heat into a bed. Thus, the new domain for energy policy ought to include

> "..all the multiple facets of energy (physical, economic, technical, financial, social) and its links with the social and economic environment" (de Oliveira & Girod 1990:531).

Thus, the scope of energy policy is radically extended to potentially intervene in any aspect of the energy chain, or transformation of the whole energy chain (de Oliveira & Girod 1990:531). Previously, the scope of energy policy had been limited to energy supply and taken energy demand for granted: energy demand was now also subject to intervention:

> "...[energy] planning can now design a future energy system on the basis of the long-term equilibrium that society wants to achieve. Energy demand is no longer a sovereign consumer's decision which the energy sector has to meet, using only prices as an adjusting mechanism. Planning can and should use many other mechanisms to lead supply and demand in directions politically chosen by society" (de Oliveira & Girod 1990:531).

Conceptually, an approach based on the energy system as a whole began with *energy end-use* as a starting point for energy policy strategies, which was tied to a further concept: energy services. The concept of energy services specified the associated service which the energy consumer received from consuming a quantity of an energy carrier. For instance, space heating can be supplied by a fire, electricity, or gas, but in fact, the consumer requires not a specific amount of an energy carrier, but what energy service the energy carrier, via a conversion technology, renders; in this case, an indoor temperature above a minimum threshold.

However, the same 'energy service' is partly provided by the house itself, and if the house is designed intelligently and insulated, in many climates heating is not required. The important point made by this simple example is that given an energy system-wide perspective, solutions to energy services-related problems (in this case, lack of heat) can be addressed by attention to an

aspect of the energy chain, or by eliminating the energy chain altogether[17]. Previously, policy options for a lack of space heating involved investigating ways in which to increase the supply of energy; these could now be augmented either by improving the efficiency of the energy chain, or by a 'non-energy' solution, such as intelligent design or roof insulation. In terms of the scope of energy policy, this possibility created linkages with almost any other area of policy which impinged on any aspect of the energy system. In particular, linkages could be made with environmental issues in every part of the energy system, the problem of energy poverty could be approached directly as an energy policy problem, and issues of economic efficiency could be addressed throughout the energy system.

The actual development of energy policy after 1973 faced a complex set of limitations. The key development comprised the creation of the International Energy Agency (IEA) by OECD countries, built on the measures for co-operatively managing potential oil supply disruptions set up in the 1960s. These measures proved ineffectual because of failures of co-operation between OECD countries which would have been necessary for their implementation (Scott 1994:37). The Washington Energy Conference in February 1974, driven mainly by the US under the auspices of Henry Kissinger, led to a number of interim measures resulting in the establishment of the IEA, which was seen strategically as a direct response to the very effective organisation of the producer countries in OPEC. Interim measures were put in place to facilitate oil distribution, and longer-term measures were put in place to prepare for future crises.

However, from an institutional point of view, the most significant aspect of the founding of the IEA lay in the adoption of an 'International Energy Programme', which "was made in binding treaty form under international law"; signatories thus

> "intended to adopt the I.E.P. in the most solemn form of international instrument to ensure the highest commitment of governments" (Scott 1994:55),

which ensured both the concerted involvement of OECD governments in the management of their energy systems through some form of energy policy, and the harmonisation of many of these measures throughout the OECD, which represented the main energy-consuming nations in the world at the time.

This programme involved not only a range of institutional mechanisms to cope smoothly with future oil crises, including mandatory strategic stocks levels and multilateral co-operation in procedures for rationing and distribution of emergency supplies, but more importantly, long-term measures to curtail dependence on imported oil, including fuel-switching and development of other supplies. Ironically the latter was made possible by the raised oil prices, without which it

[17] This would of course involve replacing heating equipment with passive solar heating, but removing heating technology from the building, except in the sense that a sun-facing window is a heating technology.

would not have been economical to develop North Sea and other fields. Thus, the core of the binding agreements at the heart of the IEA was focused solely on the problem of oil security; however, the IEA's activities focused on energy policy generally, including modelling, planning and diversifying supply, and later on a range of other areas, including environmental issues. On account of the institutional structure of the IEA within the OECD, the IEA energy policy paradigm attained unprecedented influence; this was enhanced by periodic reviews by the IEA of member and non-member countries' energy policies, as well as the establishment by the IEA of norms for collecting and processing energy data.

The founding of the IEA lent significant impetus to the development of energy policy institutions in OECD countries: whereas energy policy had generally been a subset of industrial policy, dedicated government departments or sub-departments were established in the wake of the 1973 crisis. As energy policy institutions evolved, these were restructured, merged into other policy areas, or abolished. Various institutional linkages were established: a few countries linked energy departments with environmental regulation (Denmark), others with natural resources (South Africa, Canada), and others disaggregated energy policy functions, placing energy sector policy functions with other industrial policy functions, and energy demand policy functions in specialised agencies (UK).

For instance, the UK Department of Energy was inaugurated in 1974, largely converted from another department which had dealt with 'fuels policy' from the 1940s (Cheshire et al 1978:36). The US Department of Energy was founded only in 1977 (www.doe.gov 12/11/2004), and included much of the US nuclear establishment, including responsibility for many weapons-related functions. South Africa only inaugurated energy policy activity in 1972, and only established an energy department in 1980. Of countries which are members of the IEA, in 1976 only three had separate energy departments; in 1986, nine, and in 1996, only the United States (IEA 1996a:17). At that point, 17 countries included energy policy functions in departments of trade, industry or commerce, two had Departments of Industry and Energy, two included energy functions in Departments of Natural Resources, and one housed energy policy functions in a Department of Environment and Energy (IEA 1996a:18). However, this apparent decline in the prominence of energy policy institutions masks another development: the diversification of independent regulatory authorities in energy markets, which often undertake a planning or policy role, and the diversification of energy institutions. In the UK, for instance, energy supply policy is located in the Department of Trade and Industry, but significant demand-side programmes, including energy efficiency programmes for households and industry, are located in separate agencies. In France, responsibility of energy supply policy is linked with mining and resource policy via the Directorate-General of Energy and Raw Materials in the Ministry of Industry,

whereas responsibility for developing and implementing energy efficiency and renewable energy policy and programmes is located in a non-departmental state agency (ADEME) (IEA 1996a:137).

The development of energy policies followed this institutional evolution. Whereas before the oil crisis, energy policies were aimed at increasing energy supply and replacing coal with oil and other new energy carriers, the initial response to the oil crisis (aside from international strategic co-operation) was 'energy conservation', which involved a curtailment of energy consumption and thus reducing consumption of energy services. By the beginning of the 1980s, more demand-focused energy policies had begun to replace 'conservation' with 'energy efficiency', which involved an improvement in the efficiency of conversion of energy carriers to energy services, and thus a reduction in energy consumption while maintaining the same level of consumption of energy services. Whereas conservation policies usually involved exhorting or preventing consumers from using as much energy as they had previously, energy efficiency policies involved more structural changes to the energy system, including end-use technology improvement and other measures such as boosting the use of public transport. By analogy, energy poverty problems involve a complex interaction of different societal systems, including social factors, availability and cost of energy carriers and technologies, the formal and informal economies, and other factors (Eberhard &Van Horen 1995:44-87). A supply-oriented approach would involve increasing the availability of energy carriers, based on the assumption that households would move up a 'ladder' of energy sources beginning with 'traditional' carriers such as wood, passing through a 'transition' of carriers such as paraffin, which are commercialised but inferior, and culminating with electricity or gas, which are 'modern' and convenient. An end-use approach would embrace a much broader set of factors in formulating policy options.

Energy Policy Paradigms

While there was considerable variation between energy policy regimes in different national contexts, there are a few common underlying conceptual and theoretical frameworks (de Oliveira & Girod 1990:530-531), which correspond to the phases of development of energy policy outlined above. These can thus be used as a basis for the classification of energy policy paradigms into several different types. This will be done below by developing a framework of four 'abstract' paradigms, in terms of which concrete historical paradigms can be classified. The framework, in addition to forming a system of classification, ought also to have significant explanatory power on account of the relationship between paradigm types, conceptual frameworks, and institutional capabilities; in other words, energy policy regimes which

correspond to a specific abstract policy paradigm should have certain institutional and policy-making capabilities and limitations delineated by the paradigm. Another useful property of the framework is that it provides a basis for comparing different national energy policy regimes, and thus situating these in an international context.

Defining Energy Policy Paradigms

In chapter 1, the concept of a policy paradigm was referred to, and defined as

> "..the system of ideas and standards that specify the goals of policy, the kind of instruments that can be used to attain them, and the very nature of problems they are meant to address.." (Menahem 1998:283)

To this was added an institutional dimension, which included a specific set of institutional resources (including the corresponding organisational capacity) related to the policies comprising the paradigm. It will be argued below that the historical development of energy policy outlined above can be divided into four 'abstract' energy policy paradigms, based on the conceptual frameworks underpinning the paradigm (the 'system of ideas'), a set of corresponding problems, a set of common policy alternatives, and a set of corresponding institutions. This set of paradigms is based on the general historical development of energy policy and constitutes a theoretical framework for classifying concrete energy policy regimes in different countries according to the types of actualised policies constituting their respective energy policy regimes, as well as their available organisational and institutional capabilities; this classification would then provide an insight into the capabilities of specific energy policy systems by indicating their scope and manner of response to specific policy challenges.

There are several reasons why it is possible to construct a theoretical model of this type, which pertain specifically to energy policy, and might have limited application in other policy domains. In logical terms these can be divided into external and internal reasons: the external reasons comprise global convergence of industrial systems and industrial economies and their interpenetration, the role of international agencies such as the IEA, the UNDP and the World Bank in homogenising energy policy, and the global dissemination of energy-related technology. Internal reasons comprise the logical succession of paradigms in terms of the development of institutional resources, and the match between the scope of a particular paradigm and the development of appropriate institutions and organisational capacity.

As outlined above, there are two key points in the development of energy policy globally. The first is in the 1950s, with the emergence of state interest in the energy sector specifically, and the second is in the 1970s, when the oil crisis led to a wider awareness of the energy system. This suggests two key paradigms: the first, based on the energy sector, and concentrating only on

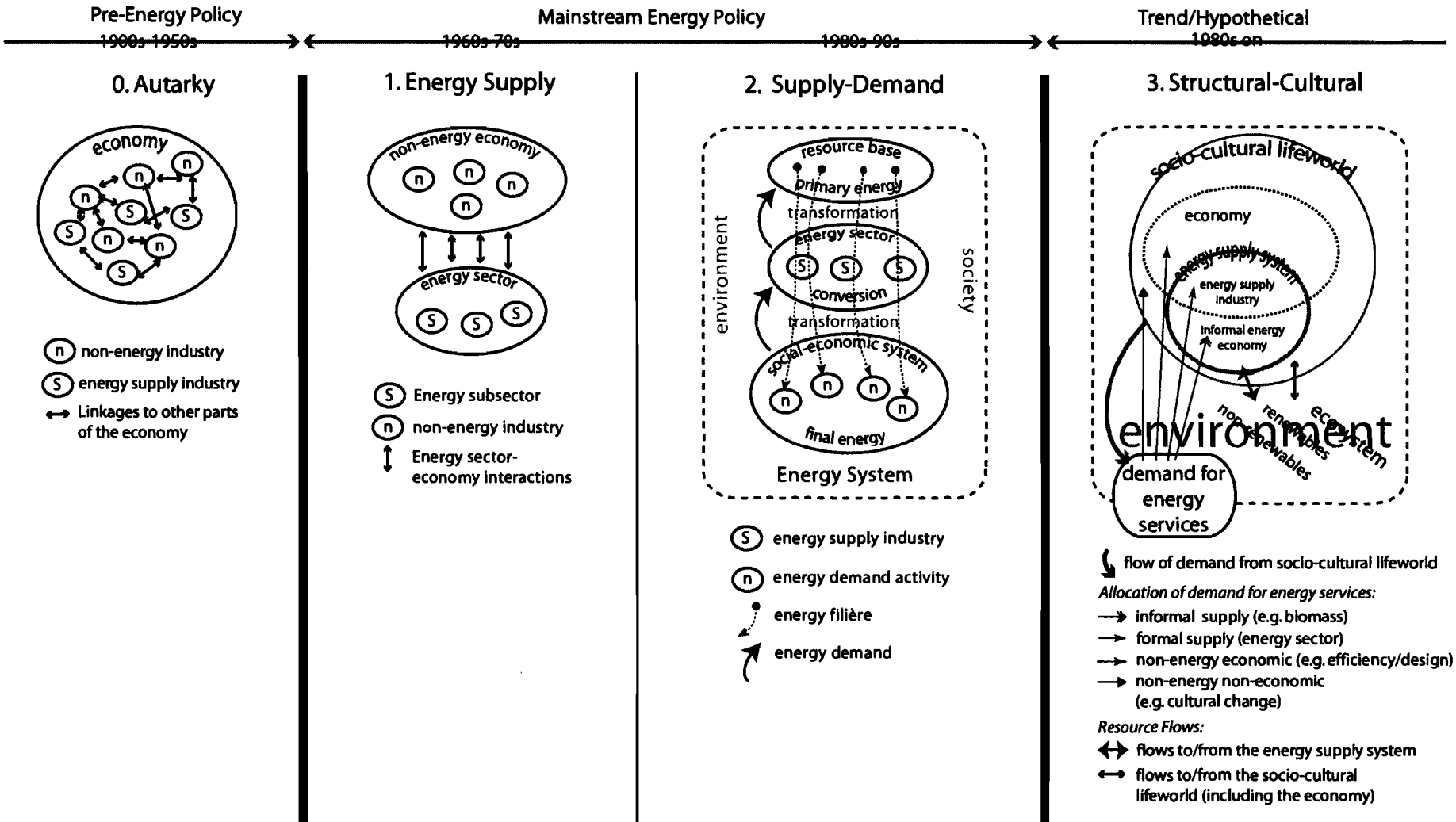
energy supply, and the second, based on the energy system, and concentrating on both energy supply and demand, since the two periods are in theory separated in terms of the criteria outlined above. The first paradigm is well-defined, whereas the second is less so: the range of policy responses is too large to be encompassed by a single paradigm. Thus, post-1973 energy policy has been divided into two paradigms. The first, which resembles many post-1973 policy regimes in the OECD, is based on an extension of the domain of energy policy to energy end-use technologies, but not further, to more fundamental aspects of the energy system such as social structure. The second includes policy interventions which impact more fundamentally on structural aspects of society-energy relationships, and have strong links to policies pertaining to other resource flows. In reality, this paradigm is largely hypothetical, and based on authors such as Lovins (1977), Patterson (1991), and especially Hawken, Lovins and Lovins (1999); the paradigm is useful however as a counterfactual, since there is a set of energy policy measures associated with complex contemporary challenges such as global warming and energy poverty which, to be implemented successfully, would probably require the institutional arrangements potentially established in this paradigm. In addition to these three paradigms, another 'proto-energy policy' paradigm has been identified, which is simply a typical set of policies applied to individual sub-sectors of the energy supply industry before the switch to energy policy. This, however, forms a useful part of the framework because a) in most historical cases, similar policies were applied to energy sector industries during this phase, and b) there were influential institutional and policy antecedents established during this phase which have significant bearing on policy outcomes in paradigm 1; another salient point (which adds a qualification to (a)) is that in different national contexts, institutional developments were shaped by the specific development of the energy system, and particularly by the key sources of primary energy (mined resources, renewable resources and/or imported energy carriers). The four paradigms are represented diagrammatically in Figure 2.2 below.

The main characteristics of the energy policy paradigms are as follows:

0. Pre Energy Policy – Autarky

In this 'pre-paradigm', energy sector industries are not governed in any integrated way. However, usually they form part of a subset of industries which are grouped together as 'infrastructure industries', providing vital inputs to the economy, and at the centre of economic growth strategies; depending on the national context, these are also grouped together as 'resource industries'. Policy, planning and regulatory processes are not integrated. Policy decision-making is almost always made by separate policy communities on the basis of relatively simply demand growth models which usually simply project recent linear trends in demand growth, and planning

Figure 2.2: Four Energy Policy Paradigms



processes are generally situated in the industries themselves. Policy is geared mainly to expanding production to satisfy rapidly expanding demand in the most economical way, as a basic input to economic growth.

1. Supply

For the first time, 'energy' is deemed an important category in the economy, and in this context implies the energy sector. Governance institutions and policy pertaining to separate subsectors are integrated, and decision-making is based on an energy supply planning process, which is in turn based on a fairly simple demand-growth scenario related to broad economic trends (in essence, an amalgamation of separate planning processes developed in paradigm 0). At a minimum, the goal of policy is to ensure sufficient energy supplies; a more elaborate approach aims to optimise the cost to society of energy supplies. Thus, this paradigm requires two institutional developments: the first is the effective integration of policy and planning decision-making in the energy sector, and the second is an organisational capacity in government to collect energy data and undertake a series of policymaking activities in terms of this data, including the setting up of an energy planning capacity. The sole focus of policy activity for this paradigm is the *energy sector*, consisting of energy supply industries; energy demand is given, and not amenable to policy intervention: demand can be temporarily contained or lowered by 'energy conservation' measures, which entail a cutback in energy services, but the only lasting solution to supply crises is to increase energy supply.

Energy modelling is based on econometric models linking demand growth to economic growth; the aim of energy policy is to ensure that growth in supply satisfies this demand (to avoid bottlenecks in the economy), and to counter rising energy prices by pursuing the most economically rational supply options. Importantly, information requirements are limited to energy supply industries and general trends in demand growth: energy demand is modelled, not researched, and little detailed information is gathered on disaggregated demand.

2. Supply/Demand

A new set of problems which did not exist in paradigm 1 form the basis of this paradigm. These include energy security and rising energy prices, related to the collapse of the pre-1973 cheap oil regime, a set of problems stemming from rapid (and accelerating) expansion of the energy supply system (including the exhaustion of economies of scale and massive financial requirements), and environmental problems. Thus,

> "..structural changes in the energy system were absolutely necessary in order to recover the security and flexibility of the energy supply.." (de Oliveira & Girod 1990:531),

which entails a broadening of energy policy focus from the *energy sector* to the *energy system*, a new concept which embraces not only energy supply, but also energy demand. The central feature of the energy system is not the production of a commodity (energy supply), but a series of transformations, which culminate in an end-use. This series is referred to as an energy filière, which is usually translated as 'chain'; this is less useful than the French term, which denotes 'channel' or 'network'[18]: although the energy system comprises many 'energy chains', these converge and diverge at significant nodes, which is why the sense of a network is useful (see Figure 2.7 for a representation of the South African energy filière).

The substitution of the energy system for the energy sector as the basic delineation of the energy policy domain has various consequences: policy is no longer focused on supply only, but on any part of the energy filière. Thus, demand is no longer given, but can be influenced by energy policies, which widens the scope of potential policy interventions significantly. Whereas demand could only be temporarily reduced through 'energy conservation' in paradigm 1 (which involves a lower consumption of energy services[19]), in paradigm 2 *energy efficiency* (lowering energy inputs while maintaining consumption of energy services) is a key policy option for avoiding supply crises.

There are two forms of this paradigm: a 'weak' form, in which demand is merely added to supply as a focus of policy intervention, and a 'strong' form, in which *end use of energy* is the starting point of policy-making; the aim of policy is then to derive the most efficient energy system capable of providing this end-use energy, which includes an efficient energy supply system, but also efficient intermediate and final energy technology.

The institutional requirements for this paradigm are fundamentally different from previous paradigms: whereas the transition from paradigm 0 to paradigm 1 required a new capability (energy information and planning) which required some institutional development, on the whole the development of paradigm 1 institutions only involved the co-ordination and centralisation of already-existing institutions and policy-making capacity. By contrast, the transition to paradigm 2 requires not only the extension of energy information and planning activities into a much more complex domain (energy demand, on which detailed information is required), but also the development of institutions capable of co-ordinating change in a very wide range of societal contexts, from appliance efficiency to building standards. In addition, many more areas of government become areas of potential policy intervention: whereas in paradigm 1, intervention was limited to the energy sector, involved forming relationships with a few stakeholders and co-

[18] Translation from the Oxford French Minidictionary (1993)

[19] Amory Lovins, who is a passionate advocate of energy efficiency, derides energy conservation as 'freezing in the dark', based on President Carter's exhortations to Americans to counter the energy crises of the 1970s by taking cold showers, lowering their thermostats and switching lights off.

ordinating and/or influencing a few other policy domains (primarily industrial and resource policy), in paradigm 2, demand-side programmes involve interacting with thousands of stakeholders and intersecting with dozens of other policy domains, from transport to rural development. Energy policy problems can thus be addressed by a much broader range of strategies, but the institutional challenges of doing so are formidable, and a sustained programme of implementation thus requires more sustained political support (and bigger budgets) than in the case of paradigm 1; building a consensus amongst stakeholders is correspondingly difficult.

3. Structural/Cultural

This paradigm, unrealised as yet in any national energy policy regime, anticipates a more complex embrace of the energy system as a domain for energy policy. The problems which this paradigm aims to address are a new generation which have only been partially (or not at all) dealt with in previous paradigms, such as energy poverty, global warming, energy-related problems of the urban environment, and other enduring environmental crises, all of which are more pervasive, complex and have more connections with other policy problems than previous energy policy problems, and require more complex policy responses.

The conceptual basis for this paradigm is the total 'energy lifestyle' of the society, rather than just the energy system. The central concept is that of 'energy services', which are services traditionally associated with the conversion of energy carriers: for instance, space heating (from an electric heater, a gas boiler or a wood fire): what is required is not electricity or wood or gas, but warmth. Since warmth can be delivered by non-energy supply measures (technical: energy efficient building construction and management practices, including insulation and passive solar heating; cultural: rethinking the built environment), the scope for solving 'energy services problems' extends beyond the energy system as defined in paradigm 2, and stretches on a continuum from technical solutions (energy supply, non-energy technical fixes) to societal and cultural change to the 'energy lifestyle' of the 'socio-cultural lifeworld'[20], of which the economy is a subset. The nexus for policy intervention is the *demand for energy services*, rather than the demand for energy, which flows from the socio-cultural lifeworld. This demand can be distributed in various ways, as illustrated in Figure 2.2.

This paradigm obviously increases the scope for energy policy-related intervention dramatically, and requires even more detailed information and planning systems in order to investigate plausible alternatives. In addition, the paradigm represents a shift from a conceptual approach to energy policy primarily dominated by a technical approach (primarily engineering or economics)

[20] The concept of the socio-cultural lifeworld has been adapted from Habermas (1995:136-137), to indicate the "totality of socio-cultural facts" (Habermas 1995:136), which comprises both social structure, relationships and activities, and inter-subjective values, attitudes and aspirations.

to one dominated by the design professions (architecture, small-scale engineering, urban planning, industrial design, etc.): whereas the energy sector is an epitome of technological enterprises reaping the rewards of economies of scale (and thus representing a high degree of centralisation), policy alternatives in paradigm 3 would probably see a transition to decentralised energy technologies such as distributed generation, but more significantly, would rely on design of local systems sensitive to local conditions (the interaction of local resource flows, the built environment, etc.). Energy policy would thus involve a far closer integration of environmental, social and economic factors than in previous paradigms.

There are two outcomes of this paradigm for institutions. First, institutions and planning processes would proliferate at non-national levels, including global institutions (to address trans-national energy and resource problems such as global warming), and local institutions which could develop the required detail for locally-sensitive design-based solutions. Second, energy policy institutions would begin to merge with others in a new set of related policy domains such as water policy (which shared almost identical efficiency problems). Energy planning would be augmented by a more complex form of 'energy services' planning, which would be integrated with other forms of information and planning (for instance, natural resource planning, rural development planning, etc).

Institutional Development and Paradigm Succession

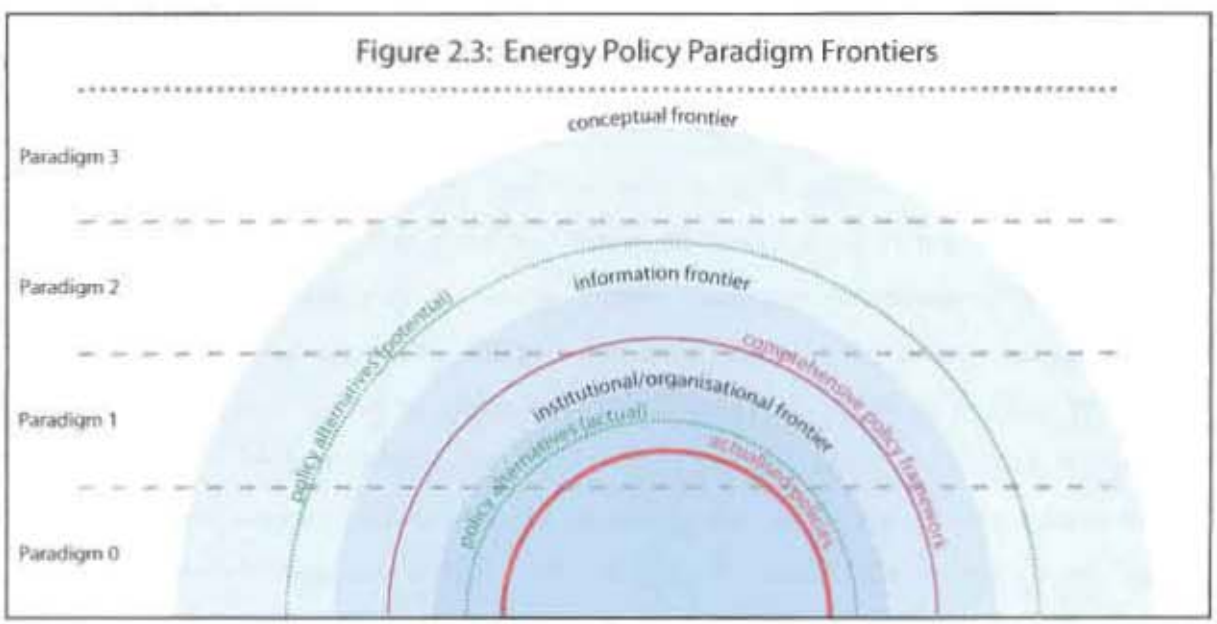
Change between paradigms outlined above involves a form of institutional succession, which is cumulative. In paradigm 0, institutional capacities are built within the state to make and implement policy separately in individual energy industries. In paradigm 1, these existing capacities form the institutional resources from which an integrated approach to energy policy is developed, in addition to which a capacity has to be created within the state to reason about energy policy alternatives. This capacity requires a) the development of routines for the collection of relevant data, and b) the organisation of that data into meaningful policy scenarios. The latter activity is generally termed 'energy planning', and is also usually developed on the basis of existing planning and information collection practices within the state. A shift from paradigm 1 to paradigm 2 requires the capacities developed for paradigm 1, plus the ability to make and implement policy over a wider domain, which requires: a) the development of an enhanced energy planning capacity, and b) the extension of energy policy to other areas of the economy. A shift to paradigm 3 requires the same expansions over a wider area, with a greater requirement for possible institutional innovation. The implications for this progressive creation of energy policy institutions is that, as observed in the previous chapter, a state's ability to successfully shift from one paradigm to another depends largely on the existing state of

institutional development, as well as the existence of significant political impetus to mobilise the required (political and fiscal) resources for institutional integration and the creation of new institutions, which is normally brought about by some form of policy crisis. Paradigm shift is usually a medium-term process due to the time it takes for new institutions to develop and begin to function. Institution succession is accompanied by a parallel process of conceptual succession: the existence of paradigm 0 institutions and planning processes raises the possibility of integration, and this integration in paradigm 1 created the conditions, and allocated the resources, for researching and extending the concept of the energy sector, and so forth.

Classification of Concrete Energy Policy Paradigms

The abstract energy policy paradigm framework is outlined above: what remains is to relate this framework to concrete energy policy paradigms in their historical context. It is *not* proposed here that concrete energy policy paradigms occur only in the four variants above, but only that they can be fruitfully classified into these categories. This classification is undertaken by considering the 'landscape' of the energy policy environment as a whole, which is represented as a series of 'frontiers' in Figure 2.3 below.

Figure 2.3: Energy Policy Paradigm Frontiers



The succession of policy paradigm 'levels' indicates the cumulative nature of institutional and conceptual development in paradigm succession. At the core of the energy policy paradigm are the *actualised policies*, on which there is a consensus within the energy policy community, and which are well resourced in terms of organisational capacity (both for policy-making and implementation). In the example above, the 'frontier' for actualised policies is paradigm 1. The frontier for actual policy alternatives is slightly broader, but falls short of the institutional and organisational frontier, which sets the limit (in terms of institutional resources and organisational capacity) to what kind of policies can be actualised in this concrete situation. The comprehensive

energy policy framework is pushed out beyond this limit, into paradigm 2, since most policy frameworks contain non-actualised policies which would require institutional reform to implement. These non-actualised policies, for a variety of reasons, do not receive the required support from the energy policy community and the political elite, and are therefore maintained for other reasons. Beyond this, still in paradigm 2, is an 'information frontier', which represents the scope of the information-collection institutions and procedures in a specific national setting as these correspond to the requirements of different abstract energy policy paradigms. Thus, if only very aggregated information is available on the energy supply industry, it is only possible[21] to actualise paradigm 1 policies, whereas if more information is available on energy demand, paradigm 2 programmes can be considered. The 'information frontier' is also very important in influencing the level of political support specific policies might attract, since appropriate information is required not only for policy deliberation and formulation, but also for establishing the validity of a specific set of problems as an appropriate site for policy intervention. Beyond the 'information frontier', this is not really possible, which would drastically diminish the resources devoted to exploring certain policy alternatives.

Beyond this lies the boundary of potential policy alternatives, not constrained by the consensus within the policy community. Unlike the actual policy alternatives, these lie slightly beyond the capacity of the information system, and could advocate significant changes to it, but whereas the actual policy alternatives are considered within the policy community and are well-resourced and backed by state agencies and power stakeholders, these potential alternatives are not, but might be advocated by groups marginal to or excluded from the energy policy community, who will inevitably be less well-resourced, and less able to sustain a presence in the policy environment, as well as having less access to policy-makers. Finally, a conceptual frontier, which extends considerably further, maps out the general capacity that the society as a whole possesses for conceiving energy policy strategies, but, although there might be intellectuals who approach energy policy from a paradigm 3 perspective, social resources are not dedicated to elaborating concrete policy alternatives on this basis.

The point of these distinctions is to identify the core elements of concrete energy policy paradigms, which in terms of Figure 2.3 and the criteria outlined in Chapter 1, comprise the inner three elements: actualised policies, actual policy alternatives, and institutional arrangements and capacity. Change in the concrete policy paradigm does not necessarily involve a change in the corresponding abstract paradigm: an energy policy paradigm might change *within* paradigm 1, for instance, since energy policy in a specific context might be (and usually is in part) structured

[21] While it is possible in theory to formulate and implement policies in a area about which one has no data, it would not be rational to do so, since the impact of the policies would be unknown.

by non-energy factors (such as apartheid), a change in which would lead to a crisis in the policy community; however, the type of core policies and institutions might still be classified in the same way.

The nature of the non-core frontiers is not, however irrelevant, but illuminating by its contrast to the core. Policy frameworks which specify policies outside the core, or non-core groups, might raise problems or alternatives which are frequently 'translated' into the dominant conceptual framework. For instance, energy poverty problems might be raised in a paradigm 3 conceptual context by non-core intellectuals or groups, which would propose a set of complex solutions. If the problem is recognised by the core (assuming the core can be classified as paradigm 1), it will be recognised more narrowly as a supply problem (which corresponds to the policy paradigm, and to the available policy alternatives and institutional capacity), to which there will be a supply solution.

The above framework will structure the exploration of the case study below, with the aim of explaining the way in which South African energy policy developed. Below, the development of the South African energy system will be outlined and placed in an international context, before proceeding to the case material in the next chapter.

The Development of the South African Energy System

The development of the South African energy system is remarkable in four respects. The first is its persistence in the use of coal as a primary energy source[22], and the associated energy chains that have been built around it. The second is the extraordinary inequality in access to energy services between different sections of the population, and thus the persistence of energy carriers such as firewood and other fuels such as paraffin in a domestic context. The third is the relatively high consumption of electricity as a percentage of final energy demand, and the fourth is the geography of the South African energy system. Linked to these factors, as well as others, is the high energy intensity of the South African economy, which is in stark contrast to the useful energy available to the majority of the population for domestic purposes. Figure 2.4 below indicates the striking difference between South Africa's persistent dependence on coal as its main source of primary energy by comparison to OECD or developing countries[23]. Figure 2.5

[22] Primary energy consumption is the total consumption of energy carriers by a national economy not produced by conversion of another energy carrier, most of which are consumed by the energy sector, which converts energy carriers from one form to another (e.g. coal into electricity) and transports these to final users. Final energy consumption is the consumption of energy carriers by consumers (not for conversion); since much energy is lost in the consumption process, total final energy requirements are usually considerably lower than primary energy requirements. Some energy carriers are not converted, but consumed directly by end-users (e.g. coal in some instances, and firewood), in which case these are classified as primary and final energy. These concepts are clearly illustrated in Figure 2.7 below.

[23] Data for coal as a percentage of primary energy is from the *BP Statistical Review of World Energy* (BP 2004); developing countries exclude ex-Soviet Union countries.

Figure 2.4: Percentage of Coal and Oil as Primary Energy in South Africa, and Comparisons with Other Country Groups

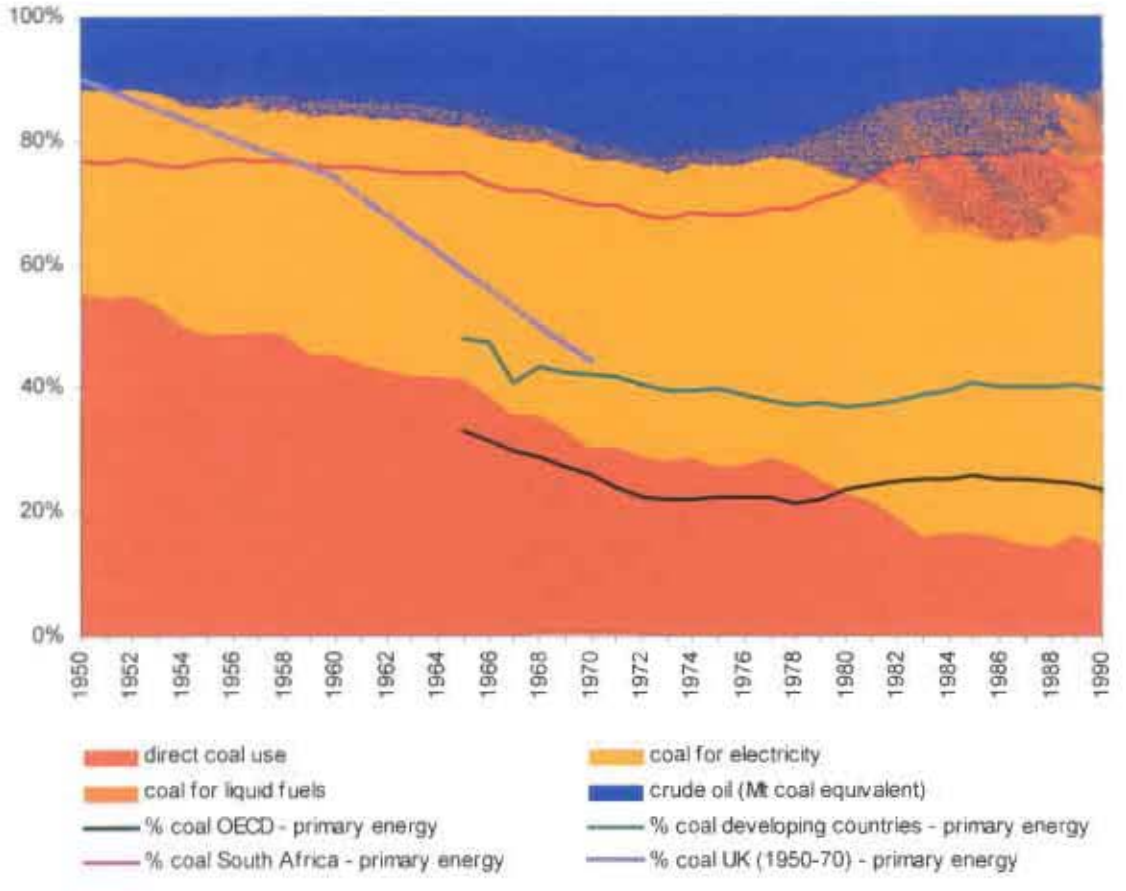
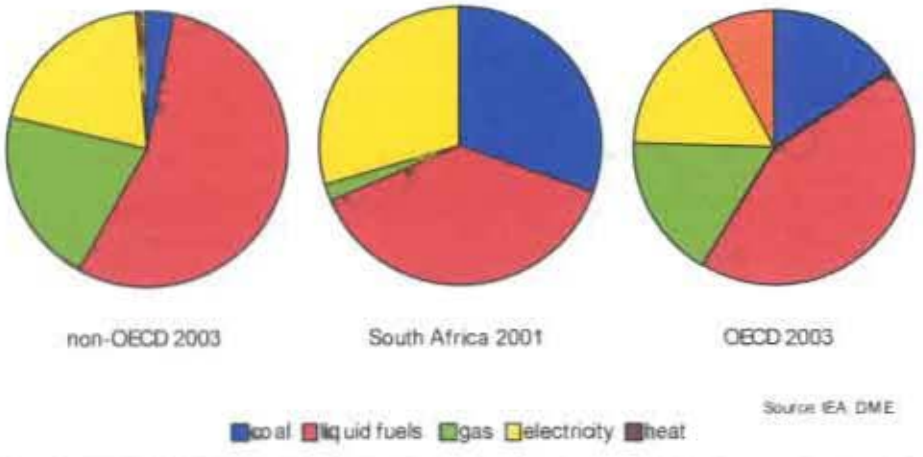


Figure 2.5: % Non-Renewable Total Final Energy Consumption by Carrier



above compares South Africa's final energy consumption[24] with OECD and non-OECD countries; what is notable is the high use of coal and electricity as a proportion of final energy consumption, the entire lack of process heat, the small proportion of gas, and the lower percentage of liquid fuels, which again emphasises the lack of complexity in the South African energy system. Figure 2.6 below provides a map of the country's energy infrastructure, which is mainly concentrated in the region around Johannesburg, and Figure 2.7 below is a representation of the South African energy filière. Other than coal and crude oil, which together comprise around 90% of primary energy consumed in South Africa, the remaining 10% comprises a small share of nuclear energy (around 2-3%), and renewable energy, comprising mainly fuelwood used by poor households (around four fifths of this), and bagasse. However, the data for fuelwood is extremely unreliable, since the first studies of fuelwood use were done in the mid 1980s, government did not take an interest in the issue until the late 1980s and early 1990s, and the data has not been regularly updated.

In addition, due to apartheid, population figures for black South Africans, and particularly rural black South Africans, are not accurate until 1996; therefore fuelwood use estimates are not likely to be accurate. Given this, Figure 2.4 above indicates some remarkable differences between the development of the South African energy system and others. From 1950 to 1973, in most of the rest of the world, including developing countries, there was a transition from coal as the main source of primary energy to crude oil. The data represented above in Figure 2.4 for the OECD is from 1965 onwards, but the trend for the UK from 1950 to 1970, is indicative of the rest of the OECD (see for instance Chesshire et al 1978, Goldemburg et al 1988, Saumon/Puiseux 1978, Bupp 1978); developing countries, with a few exceptions (notable ones include China) followed the same energy transition. South Africa, on the other hand, saw a slight decline in coal as percentage of primary energy until 1977, from which time a combination of the decline in the growth of liquid fuels consumption, the expansion of the electricity system and the development of the synthetic fuels industry contributed to the decline in the percentage share of oil. On the whole, crude oil did not replace coal as the main source of primary energy, but was itself reduced by the 1980s to a relatively small percentage of South Africa's primary energy requirement.

There are a number of reasons for this development, which can be explained through the innovative concept of a 'Minerals-Energy Complex' (MEC), developed by Fine and Rustomjee (1996) to explain the peculiar form of South African industrialisation. The MEC is a constellation of economic activities built around mining, particularly gold mining, and energy industries, which have developed symbiotically in South Africa in the last century or so. The reason why the MEC thesis is important is that orthodox economic classifications distinguish

[24] See footnote above.

between mining and industrial activities in the economy, and thus convey the impression that the importance of the minerals sector has declined in South Africa in the past 50 years by comparison to manufacturing and other activities. However, the many complex relationships between mining and manufacturing activities renders this conclusion somewhat misleading. Much industrial activity involves basic beneficiation of minerals, as well as 'backward linkages' which provide commodities such as explosives and iron and steel products for mining activities. Fine and Rustomjee include the following sectors in the MEC:

> "coal, gold, diamond and other mining activities; electricity; non-metallic mineral products; iron and steel basic industries; non-ferrous metals basic industries; fertilizers, pesticides, synthetic resins, plastics, other chemicals, basic chemicals and petroleum" (Fine & Rustomjee 1996:79),

as well as other related sectors. This classification reveals that, contrary to orthodox models,

> "..the growth of the MEC has been accompanied by stagnation of the non-MEC manufacturing sector since 1960" (Fine & Rustomjee 1996:82).

Thus, a reclassification of economic data reveals that even though mining's share of national economic activity has declined, a mining-industrial complex lies at the heart of the country's industrial system. The classical assumption that South African industrial policy has been dominated by import-substitution-industrialisation is also called into question: even though the establishment of industries such as iron and steel can be understood as import substitution, the process occurred in reverse, with primary industries developed first. Moreover, much import substitution policy in the 1970s was primarily targeted at overcoming sanctions and saving foreign exchange, especially in the defence and energy sectors (South Africa 1979).

The core of the MEC is the interrelationship between coal, electricity and gold mining, which was later expanded into more complex relationships between mining, electricity, beneficiation and crude oil- and coal-based petrochemicals industries. These interrelationships were mediated by the peculiar features of the colonial and apartheid states, which included reliance on cheap black labour and concomitant social and economic inequality and political repression, as well as a collection of state-owned enterprises in electricity, iron and steel, petrochemical and liquid fuels, and industrial financing and development, which played a key role in the development of the MEC, as well as the persistence of economic inequality.

The origins of the relationship between coal and gold, as well as the birth of the modern South African economy, can be traced to the beginning of the gold-mining industry in South Africa in the late 19th century. Gold was discovered in what was then the independent South African Republic, or Transvaal, and the development of the industry led to the Anglo-Boer War (1899-1902), which ended the independence of both the Transvaal and the Orange Free State (which became British colonies), and were amalgamated with the Cape Colony and Natal in 1910 to

Figure 2.6: Energy Supply Infrastructure in South Africa (1996)

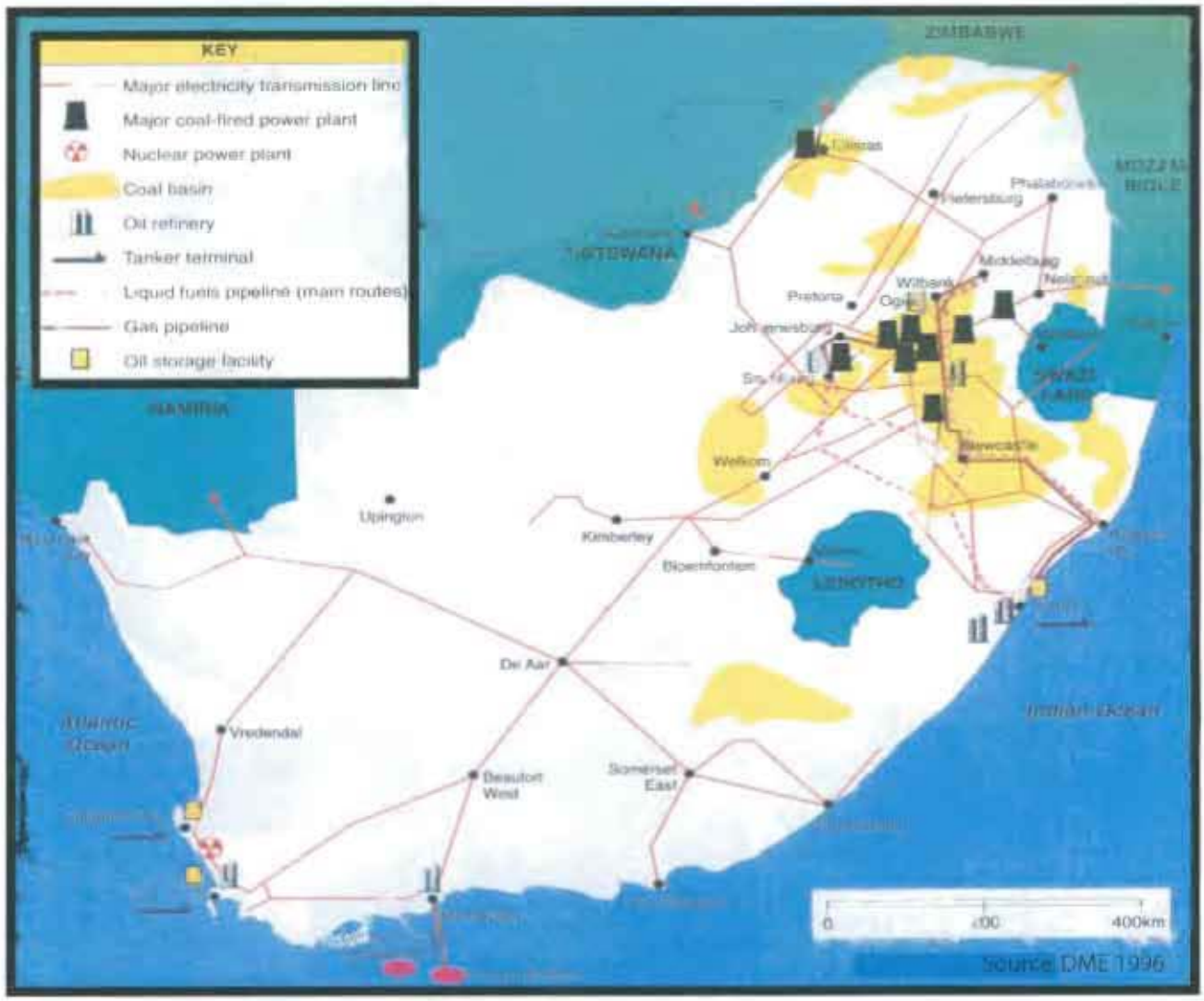


Figure 2.7 The South African Energy Filière (1993)

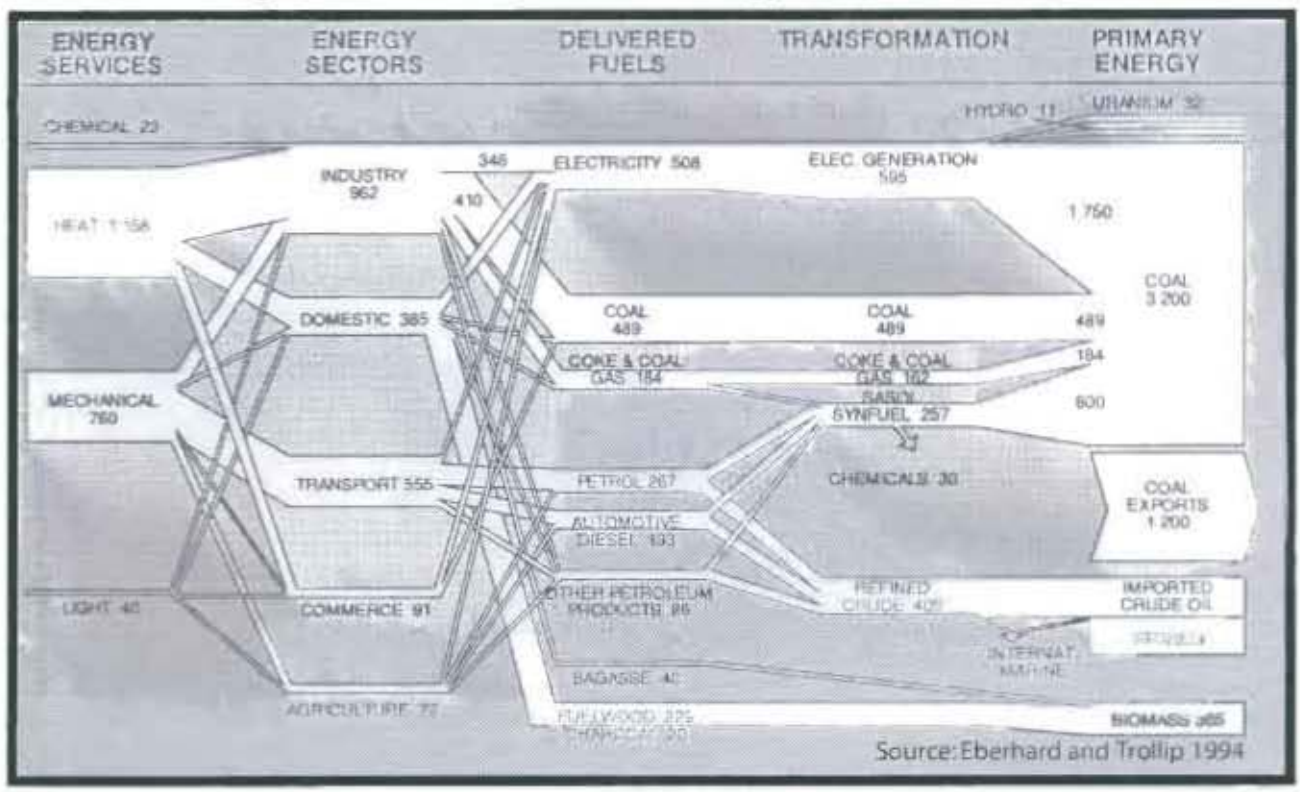


Figure 2.6 was sourced from Department of Minerals and Energy (1996). Figure 2.7 was sourced from Eberhard & Trollip (1994:24). The units in Figure 2.7 are Petajoules

form the Union of South Africa. Due to the nature of the geology of the gold deposits, gold mining in South Africa required large supplies of energy, as well as cheap labour. While labour was supplied through repressive colonial and then apartheid migrant labour systems, the energy problem of the gold mines was solved through the discovery of significant coal reserves, which were used as the basis for both a railway system and the establishment of an electricity system, initially under private and later under state ownership.

The establishment of the state electricity utility, as well as the subsequent establishment of other key components of the MEC, was overseen by two figures who were at the centre of the development of a range of state structures which were key to the development of the MEC. The first of these was Hendrik van der Bijl, who was brought in by Jan Smuts[25] to establish Escom, the state electricity utility, and later, Iscor, the state iron and steel manufacturer. His protégé and successor, Hendrik Van Eck, was the head of the Industrial Development Corporation; he and the IDC played a key role in the development of Sasol, the synthetic fuels corporation, as well as in other energy-related developments, including the funding and development of the nuclear establishment and other mega-projects such as hydroelectric schemes. The IDC played a key role in the development of Sasol 2 and 3, as well as the energy-intensive beneficiation projects of the 70s and 80s such as Alusaf (the initially state-owned aluminium smelter, built to use excess generating capacity and later privatised). These developments have been dealt with in Chapter 4 in more detail.

The focus of these strategies was to develop South Africa's indigenous resources in an integrated fashion. While the state played little direct role in the development of South Africa's coal resources, it played a key role in the development of both the electricity and liquid fuels industries, as well as the nuclear establishment. The electricity industry was developed from the 1920s onwards, but came into its own after the second world war. The liquid fuels industry began with the importing of liquid fuels in the late 19th century, and a privately-owned refining industry was established only from the 1950s to the 1960s. At the same time, the state established Sasol in the late 1940s, a state-owned corporation to manufacture liquid fuels from coal using the Fischer-Tropsch process. The capacity of Sasol was massively expanded in the 1970s in response to the oil embargo. The effect of this can be seen in the significant increase in consumption of 'coal for liquid fuels' in Figure 2.4 above at the time; the total share of primary energy consumption for liquid fuels manufacture thus comprises the crude oil total and a significant percentage of coal consumption. The synthetic fuels projects represented a higher degree of integration of the liquid fuels sector into the MEC: whereas the refinery industry was really only linked via the petrochemicals industry, Sasol used South African coal as a feedstock.

[25] Prime Minister at the time.

Since around half the primary energy in the synthetic fuels process was used to manufacture a synthetic crude (which was then refined), the process significantly increased the energy intensity of the economy; in the 1980s, around two thirds of the primary energy for liquid fuels went into the Sasol process, but it produced only around one third of the liquid fuels in the country.

From the 1950s, the state also developed a significant nuclear establishment, which was initially seen as a potential extension of the MEC, based on local uranium rather than coal. The nuclear programme produced nuclear weapons as well as establishing a full nuclear fuel cycle by the end of the 1980s, but the contribution of nuclear energy to primary energy consumption was and is negligible; the country possesses only one nuclear power plant, and both the weapons programme and all elements of the nuclear fuel cycle were shut down during and immediately after the transition process in the 1990s. Eskom is currently involved in efforts to develop a new-generation 'pebble-bed modular reactor', but this remains several years away from commercialisation.

The development of energy policy in South Africa occurred in several phases. Because of the ubiquity of cheap coal, as outlined above, the confluence and interpenetration of different elements of the energy sector did not take place in South Africa until the 1970s. Thus, the conditions of paradigm 0 apply until the early 1970s, when both the oil crisis and a reassessment of coal resources led to the possibility of developing a large-scale synthetic fuels industry. At this point, the state created an energy policy capacity in government, and attempted to develop an integrated energy policy framework along the lines of paradigm 1. This trend was reinforced by the 1979 crisis, which heightened the risk of a complete oil embargo against South Africa, by the creation of a separate Department of Mineral and Energy Affairs in 1980. Energy policy capacity was further expanded in 1987 with the formation of a National Energy Council; however, this was abolished in 1991, and its functions were reincorporated into the Department of Mineral and Energy Affairs, and energy policy capacity was significantly decreased. After a transition period, from 1992 to 1996, the post-apartheid government formulated a new energy policy framework, which is currently being implemented. Despite forays into paradigm 2- and 3-type policies in the late 1980s, during the transition, and in the post-apartheid policy framework, energy policy has reverted to paradigm 1, for reasons which will be explored in the next five chapters.

Thus to conclude, in terms of broad structural features underlying the development of South African energy policy, there are three which are particularly important. The first is the relatively simple structure of the South African energy system, in particular its overwhelming dependence on coal and the small number of primary energy sources, and the limited potential for substitution between energy carriers. The second is the importance of the MEC, not only because

of its close relationship with the energy system as a whole, but also because of an associated 'industrial policy complex', which was very influential in the development of energy-related policies, and was focused on a minerals-based and energy-intensive form of industrial development. This industrial policy complex consisted of a number of overlapping policy networks focused on different sectors, and co-ordinated by what can be termed an 'industrial policy elite' concentrated in agencies such as the IDC and the state's economic planning machinery, with close connections to the political elite. The third feature was apartheid, which resulted in several factors crucial to the development of energy policy and the energy system. The first was the social, economic and political exclusion of the majority of the population, which resulted in extremely uneven infrastructure development focused only on the 'white' population of the country, and emphasised the industrial focus of energy policy. The second was the threat of sanctions (oil and nuclear – see Chapters 5 and 6), which provided a strong impetus for both energy policy-related institutional development, as well as for large-scale strategic investments in the energy sector. The third was the related culture of secrecy, combined with the impact on the policy system as a whole of the restrictions apartheid placed on political activity, which resulted in secretive and informal policy and regulatory processes, which exacerbated some of the lacunae of apartheid-era energy policy. These features will be discussed in the chapters below, and revisited in the Conclusion.

Chapter 3

The Development of South African Coal Policy

Overview

Coal has been used in southern Africa on a very small scale by pre-industrial societies for hundreds and perhaps thousands of years; however, as in other parts of the world, the large-scale production and utilization of coal began with the development of industrial processes. In the South African case, it was the birth of the mining industry in the late 19th century which led to the industrial development of coal resources. The impetus for coal exploration and production began with diamond mining, but the main development of the modern industry occurred with the discovery of gold in the 1890s in the area around Johannesburg. The development of the two industries was very closely related: coal, and later coal-generated electricity, was required to provide energy for mining and minerals processing, as well as for the supporting infrastructure which developed around the mining economy (including the railways system), which formed the basis for the later development of South Africa's industrial economy. Since coal forms, and has formed, the basis of the South African energy system, the development and organisation of the industry, as well as the associated policies and institutions, provide a key to understanding the emergence and development of energy policy in South Africa; below, the nature of coal resources and the development of the coal industry and market are briefly outlined, before reviewing the development of coal policies and related institutions.

Production, Coal Reserves, and the Coal Market

Coalfields in South Africa are concentrated in four areas: in the Free State, Mpumalanga, Kwazulu-Natal and the Northern Province, with most production concentrated in the Mpumalanga region (see the map in Figure 2.6 for the location and extent of South African coalfields). The structure of the coal industry was divided geographically between producers in the pre-1994 provinces of Natal, and the Transvaal and elsewhere. Natal coal was of a higher average quality but more expensive to produce, and further from the key markets comprising the mining districts around Johannesburg; the small early ships' bunkers and export trade was based in the Natal coalfields, which also contain a high proportion of the country's high-grade

metallurgical coal deposits. South African coal is geologically distinct from coal elsewhere, especially in Europe and the USA; it tends to have a lower sulphur content but a higher ash content, and on average a much lower calorific value. In addition, the geology of South African coal seams is very favourable; these are generally thick and located near the surface, allowing relatively easy extraction, as well as the relatively easy introduction of advanced mechanisation and open-cast mining.

Coal mining and processing technology developed in two phases. Before the 1970s, a relatively narrow spectrum of non-beneficiated[26] products was produced by relatively non-mechanised mines, which had very low extraction rates[27], whereas during and after the 1970s, a colossal wave of new investment in the industry introduced new technology, including beneficiation technology, which dramatically improved extraction rates and diversified the coal market considerably, including the development of a massive export market. Technology development was retarded by two factors. The first factor was cheap labour, which was one of the cornerstones of both colonial and apartheid-era policy. Wages were kept at very low levels by a range of coercive measures until the 1970s[28], when international pressure[29], combined with a newly-militant black labour movement, forced wages up. The second factor was the low regulated domestic market price of coal and the decline of the coal export market (see below); as a result, there was little incentive to invest in more mechanised forms of coal mining until the 1970s, when a combination of government policy (which raised prices, promoted exports and promoted mechanisation), wage increases, the resurgence of the international coal market and the diversification of the local market (see below) provided the necessary incentive. The result of this technology revolution was a significant growth in coal reserve estimates, which will be discussed below, before a review of the development of the coal market.

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[26] Coal beneficiation is the separation of different grades of coal from the general production stream from a mine, which is generally done by exploiting the different densities of different coal grades, to meet specifications of specific coal markets.

[27] An 'extraction rate' is the percentage of coal which is extracted from a given coal seam, which depends on the mining technology used. Old coal mining technology left a considerable proportion of the coal (up to 80%) *in situ* as 'pillars' to prevent the collapse of the ceiling, whereas other techniques (such as open-cast mining) extract up to 100% of the coal.

[28] For a comprehensive economic discussion of the wages of black miners, and how these were kept at extremely low levels, see Wilson (1972). Wilson painstakingly establishes that black mineworkers' extremely low wage levels had little or nothing to do with a 'free market' in labour in southern Africa, and were mostly determined by the repressive and restrictive colonial and apartheid legal frameworks, which placed severe restrictions on labour mobility, protest and unionisation, while simultaneously forcing black South Africans out of other economic niches, and barring them from other significant economic opportunities, as well as barring black mineworkers from any jobs in the mining industry except the most unskilled ones; the others were reserved for white workers. In addition to this, labour recruitment was organised by the mining industry as a monopsony to prevent competition for labour pushing up wages.

[29] This included international pressure from unionised dock workers in the early 1970s, who refused to unload coal because black South African mineworkers were 'indentured labour' – in terms of apartheid legislation, this was substantially true, since (amongst other more general restrictive measures), it was a criminal offence for black mineworkers to resign (or 'desert') until their contracts expired.

Coal Resources and Reserves[30]

The historical development of information on coal reserves is an excellent example of the relationship between the development of institutions and policy paradigms: a uniform method for assessing reserves and the development of appropriate institutions to do so only developed gradually during the 20th century with the development of coal policy. During the first half of the 20th century, interest in coal reserves was minimal as it was assumed that coal deposits were effectively infinite. Interest in total available reserves began with a focus on metallurgical coal, which was thought to be scarce in South Africa, and expanded to coal in general only during the 1960s. The political significance of resource and reserve estimates was based not only the available tonnage of coal, but on an assessment of future coal consumption; this was a key focus of coal and energy policy only during the 1970s.

The first official assessment of coal resources was made by the 1921 Coal Commission, which did not distinguish between resources and reserves, and reported that the total coal resources of the Union were 56 200 million short tons[31], or 44 960 million metric tons (1920-21 Coal Commission), a rough figure based on a partial survey of operating coalfields, which in terms of contemporary annual consumption of around 10 million tons per annum, meant that resources would be exhausted in around 5000 years; thus coal resources were regarded as inexhaustible. A note of unease was injected by the 1939 Committee of Inquiry into the Base Minerals of the Union which investigated the first potential coal scarcity problem in the Union: the adequacy of an indigenous supply of metallurgical coal for the newly-founded state-owned steel industry. The Committee conceded that "..the extent of the Union's resources in coal of coking value is not at present known.." (1939 Base Minerals Committee:42), and the outcome was the development of systematic processes for reserve assessment. These did not provide adequate data for the 1947 Coal Commission, the main task of which was to provide an assessment of metallurgical coal reserves to determine whether conservation measures were necessary: the Commission developed its own methodology and gathered its own data (1946-47 Coal Commission:27), using for the first time a conceptual distinction between 'resources' and 'extractable coal' (under prevailing economic and technical constraints). Because of the Commission's methodology, it did not provide a total assessment of non-metallurgical coal: later analysts have compiled an estimate of 12 200 million tons of 'extractable' coal from the Report (1970-75 Coal

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[30] The distinction between the two is generally considered vital for any form of resource planning (including investment in large projects). 'Resources' comprise the quantity of coal or other resource which it is feasible to extract *technically*, and is thus limited by the technology available at the time, whereas 'reserves' comprise the portion of resources which can be extracted *economically*, which is thus influenced by a range of factors. These include price (a higher price thus increases reserves), and in the case of coal and other non-uniform resources, product specification: thus, if for instance a market develops for very low-grade coal (which was previously not mined or discarded), then reserves increase accordingly, since although this category of coal could previously be extracted, it did not have any economic value and was thus excluded from an assessment of reserves.

[31] One short ton=2000 imperial pounds, which is 0.8 metric tons

Commission:7). This basic methodology was revised and extended; in the 1950s, geologists estimated resources of 59 898 million tons (1952) and 63 905 million tons (1959) (1970-75 Coal Commission:7). The 1969 Coal Advisory Committee estimated 24 885 million tons of economically recoverable reserves of bituminous coal. After an exhaustive reassessment, again further developing the methodology of reserves estimation, the Petrick Commission reached a similar figure in 1975 of 24 915 million tons of economically recoverable bituminous coal, out of a total of 81 274 million tons of mineable bituminous coal resources (1970-75 Coal Commission:7). Given extraction technologies and coal prices at the time, these figures caused a policy crisis, and energy analysts suggested that the country would have to seek alternative energy sources by 1990 (see below); however, partly as a result of the success of 1970s coal policy measures, new estimates in the 1980s were 121 218 million tons, of which 51 960 million were economically recoverable (South Africa Coal Statistics 1993:4), and the 2001 estimate for economically recoverable coal was 55 333 million tons (Department of Minerals and Energy 2002a:50), which pushed back the possibility of real coal shortages to the last quarter of the 21st century.

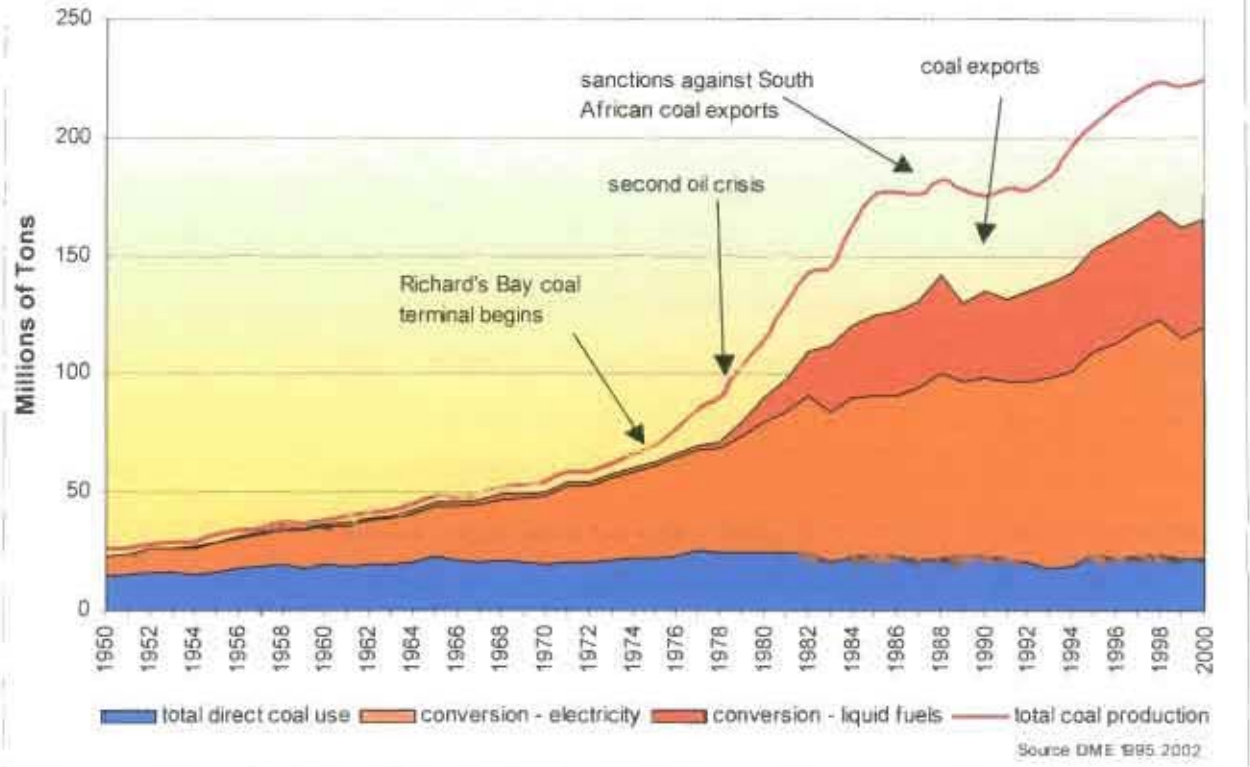
The Development of the Coal Market

Up to the 1950s coal was mined on a relatively small scale, and was used directly[32] by the railways, mines, industries, and households, and for conversion into electricity by a largely decentralised electricity industry. Since 1950, coal use and production has been influenced primarily by four broad trends: no growth (and eventually a slow decline) in direct use of coal by consumers; a rapidly expanding coal-based electricity sector; the rapid development of the synthetic fuels industry during the 1970s; and the equally rapid development of a massive export industry from the early 1970s. These combined trends led to the doubling of coal production from its 1950 level by 1970, and an eightfold increase by 2000, illustrated by Figure 3.1 below.

The evolution of the coal market occurred in three phases. In the first phase, from the inception of the industry until the 1940s, the market consisted of consumers who used coal directly, including the railways, and a nascent electricity industry. There was a significant export trade; until the late 1940s, between $^1/_3$ and $^1/_6{}^{th}$ of the annual tonnage was exported (1946-47 Coal Commission:15-16), which dropped to around 2% between the 1950s and 1970s (Department of Mineral and Energy Affairs 1995:13). Mining was largely labour-intensive, inefficient and unsafe, with the gradual introduction of mechanisation. The state began to impose coal grading in the 1920s, but the price was set by the market, subject to the behaviour of a number of cartels

[32] 'Direct' use of coal, which is referred to often below, is the use of coal by consumers themselves (primarily in industry), as opposed to its use by industries (electricity, synthetic fuels) which convert the coal to another energy carrier which is then used by the consumer.

Figure 3.1: Coal Demand and Total Production, 1950-1993



which were organised in most of the market. There was a clear nexus between the coal industry and the railways: the railways were largely dependent on steam coal as fuel, and the coal industry was almost wholly dependent on railway transport to distribute coal to consumers.

In the second phase, from the 1940s to the early 1970s, the state imposed price control on the domestic market, and limited exports. The regulated price was set using a rate-of-return methodology which did not recognise depreciation, and pricing was also used as a means to encourage industrialisation and combat inflation. As a result, domestic coal prices during this period were "..the envy of every visiting industrialist.." (Lang 1995:127), and some of the lowest in the world. The structure of the market began to change: demand for electricity generation began to predominate, increasingly at a new generation of mine-mouth power plants, which bypassed the transport problems bedevilling the rest of the industry. At the same time, electrification of railways proceeded and direct coal use stagnated as industries were electrified or switched to liquid fuels. Exports declined as a percentage of production to very low levels during this period, on account of a stagnation of the international coal market (as coal was replaced by oil), the loss of key markets (the Far East in particular) to competitors, building anti-apartheid pressure, and recurring rail transport bottlenecks, which made it difficult for producers to fill export orders reliably (Lang 1995:133); in addition coal policy discouraged exports during this period. As a result, the South African coal industry stagnated, with a semi-feudal labour-intensive production structure and a relatively low level of mechanisation and extraction, with

very little differentiation of product and little beneficiation. Inflation in the 1960s, without concomitant price increases, meant that capital investment was at very low levels, and most production came from old mines. Expansion in the coal market was limited to new long-term contracts with Escom[33], the state electricity utility, which were usually negotiated at significantly below the regulated wholesale price.

The third phase, from the 1970s to the present, was a watershed for the coal industry. The change in policy engendered by the Petrick Report lead to significant real increases in the regulated domestic price, and an emphasis on increased extraction and utilization rates, which were conditions for the issuing of export permits. While the direct coal market remained static, the electricity industry launched a massive expansion programme during the 1970s, and a large-scale synthetic fuels industry was inaugurated from the late 1970s, which together dominated coal demand from the late 1970s onwards. An additional factor was the resurgence of the export market, which increased dramatically in the late 1970s as a result both of a resuscitation of the world coal market in the wake of the 1973 oil crisis, and a change in government policy towards exports. The key factor in reviving the export industry was the development of the Richards Bay Coal Terminal in a deep-water port north of Durban, and an associated dedicated rail link from the most important coalfields to the port, which solved the logistical problems which had bedevilled the industry before the 1970s. The link between the railway system and the coal industry was thus largely broken by the 1980s, as most coal (for electricity, synthetic fuels and export) was either consumed at the mine mouth, or transported via the dedicated rail link to Richards Bay.

Increased demand, higher regulated prices and the promise of the export market led to the transformation of the image of the industry in the eyes of investors: the coal industry of the 1960s only had a market capitalisation of R175 million, and key figures in the mining industry talked publicly about the folly of investing in it (Financial Mail 27/11/1970). By the end of the 1970s, revenue for the industry was over R2 billion, and the Financial Mail reported that

> "Coal shares are amongst the most expensive on the JSE; it's not difficult to see why.. ..the coal sector was the top performer on the JSE [in 1976/7]" (Financial Mail 22/4/1977).

Capital flowed into the industry, in time to fund a significant expansion in production capacity, including a large number of new coal mines. Coal output more than doubled between 1970 and 1980, and quadrupled by the end of the century.

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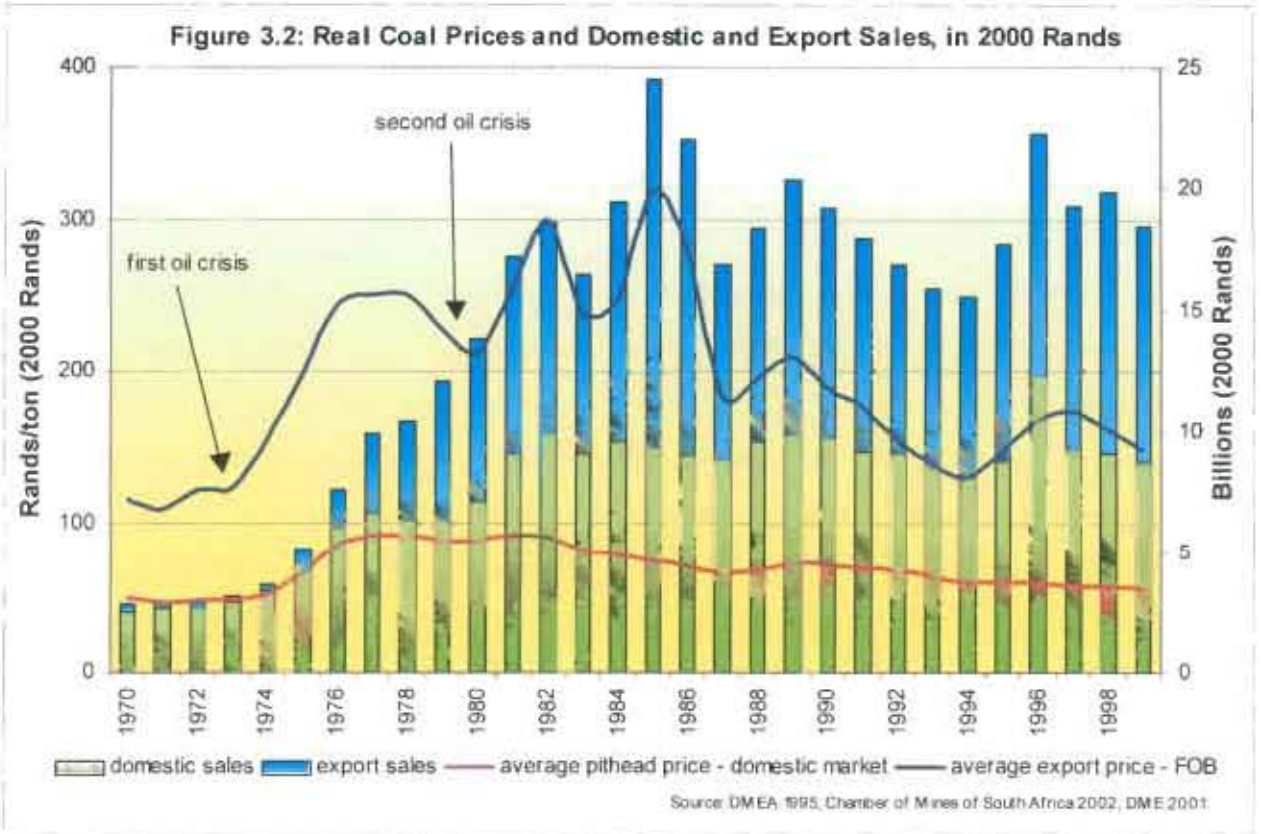
[33] The Electricity Supply Commission, the name of which was changed to Eskom (not an acronym) in the 1980s. Unlike Escom, Eskom is not an acronym, but a combination of the English and Afrikaans acronyms: Escom and Evkom. These names will be used interchangeably, but where possible, the name which matches the historical context will be used.



The resurgence of the export industry changed the revenue structure of the coal industry significantly, since export prices were significantly higher than domestic prices, as illustrated by Figure 3.2 above.

The relationship between domestic and export prices was not straightforward, for three reasons: first, the former was regulated until 1986, and set without reference to the international coal prices; second, most domestically-consumed coal was effectively a different commodity due to its low calorific value – the export market thus did not constitute an alternative market; and third, most domestic coal was sold on long-term contracts, the prices in which were not linked to the international market. Thus, even after deregulation, significant price movements on the international market (for instance, the surge between 1994 and 1998) were not mirrored on the domestic market, which was an important factor in reinforcing the autonomy of the South African energy economy from world trends in energy prices.

Export prices rose during the 1970s, declined towards the end of the decade as the oil market stabilised, and then rose again after the second oil crisis. Real prices declined in the mid to late 1980s, partly because of world oversupply, and partly because of sanctions against South African coal, which lasted from the mid-1980s to the early 1990s. Real domestic (administered) prices rose steadily in the wake of the Petrick Commission (see below), and declined thereafter as a result first of government granting below-inflation increases in the regulated price (early 1980s), and then because of deregulation and competition; however, the domestic market declined in importance during the 1980s and 1990s, and is currently the source of only around 38% of

revenue. At the beginning of the 1970s, it had been the source of 90% of the industry's revenue (Chamber of Mines of South Africa 2002:12).

Actors and Institutions

1) The Coal Industry

The way in which the coal industry has been involved in policy-making processes over the last century depended on both the structure of the industry itself, and the way in which its collective interests were represented. Ownership of the South African coal industry has, since the beginning of the 20th century, been concentrated in a few large mining houses, whose main economic activity was gold mining, the energy requirements of which was their main motivation for involvement in the coal industry. Income from coal mining provided only a fraction of the income derived by the mining industry from gold, until the coal export boom began in the 1970s, when coal, and particularly the export market, began to provide a considerable revenue stream in its own right (see Figure 3.3). Up to this point, coal interests had been subordinated to gold interests, but from the 1980s, the industry underwent a restructuring process which severed the relationship between gold and coal. The development of the structure of the industry, and the representation of its collective interests in the policy process, occurred in three phases.

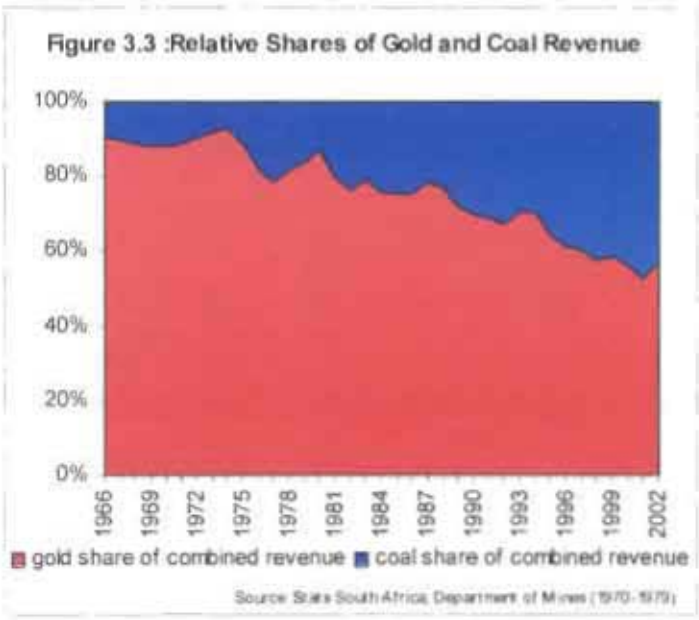


Figure 3.3 :Relative Shares of Gold and Coal Revenue

Source: State South Africa, Department of Mines (1970-1979)

The first phase, from an initial process of development and consolidation, lasted until the late 1960s, and was characterised by a loose holdings structure focused on providing coal for the domestic market. The most important organisational structures were a series of cartels, the first and subsequently most successful and important being the Transvaal Coal Owners' Association (TCOA), which was formed in 1908[34], the purpose of which, in the words of the President of the then Transvaal Chamber of Mines, was "..to put an end to what was considered in some quarters a ruinous competition". The aim of the association was to regulate coal output and price, and

[34] The TCOA was subsequently reorganised in 1923; some historians cite this as its founding date.

thus to facilitate a "fair return" on behalf of investors (Lang 1995:57); in other words, to control the coal market.

Following this, a range of other cartels were formed on a similar basis, including several associations in Natal (of which the Natal Associated Collieries (NAC) was the most enduring and influential), the Anthracite Producers' Association (1962) and the Coke Producers Ltd (1925). The TCOA represented the vast majority of coal-mining activity in the country, and its involvement in policy-making, regulation and general interaction with the state was the most significant; it, along with the NAC, was represented on almost every influential advisory or statutory body which had a bearing on the coal industry, since the state regarded these bodies as representative of the coal industry as a whole.

Collieries competed for long-term contracts with large customers such as Escom, but almost all other coal on the domestic or export markets was sold through the TCOA until the 1970s. Amongst its other roles, the TCOA also co-ordinated production between collieries for large export contracts, such as the early export contracts with Japan in the 1970s. Non-TCOA members were admitted to the cartel after they had demonstrated that they possessed significant market power, which was the case with the bloc of collieries owned by emerging 'Afrikaner capital'[35] in the 1950s; these were, as with the other collieries at the time, incorporated into an 'Afrikaner capital' gold-mining consortium. The gold-mining context was somewhat unusual, since the cartel was not successful in charging monopoly rents for coal, which was in fact underpriced for large periods of its existence. Christie (Christie 1984:41) suggests that gold-mining interests undermined the cartel by owning collieries inside and outside it. This might have been the case up to the 1920s, but the industry was almost completely owned by gold mining houses after that; thus, a more persuasive explanation lies in the amelioration of risk by the gold mining establishment. Two of the key risks for the mining establishment, in an environment where the geology of gold reserves required deeper and deeper mines[36], was the possibility of spiralling energy costs, or even volatile energy markets, and competition for cheap labour. The function of the cartels in controlling the market was not to earn monopoly rents, but to prevent non-gold market participants from extracting rents, and from competing for labour (and thus increasing wages). The coal industry was mainly viewed by the gold industry (who

[35] A central policy of the National Party government (in power from 1948 to 1994), which was strongly Afrikaner nationalist, was to challenge the 'English' economic hegemony: in 1948, not only was the economy almost entirely owned by English-speaking South Africans, but there was a significant difference in income levels between English-speaking and Afrikaans-speaking white South Africans (O'Meara 1996:74). The government sought to remedy this by promoting Afrikaner ownership of the economy, and particularly the mining industry, traditionally dominated by English-speaking South Africans with strong imperial connections.

[36] Deep-level mines (from 500m to several kilometres) pose unique problems which usually require energy-intensive solutions, both for construction (shaft-sinking), transport, and most importantly, air conditioning, without which it is impossible to work at those depths, in addition to other more routine energy-intensive problems of hard-rock mining. This type of mining is also labour-intensive, and the South African model of deep-level mining was built on ultra-cheap labour.

owned it) as a supplier of cheap energy for gold mining; thus, profits lost on coal could be recouped through cheap inputs to gold mining, as

> "..some mining houses had a bigger interest in what they paid for energy than in what they earned from coal.." (Lang 1995:147).

Coal production costs, and labour competition problems, were controlled through the collieries joining the gold mining labour monopsony, the aim of which was to prevent competition between mines pushing up wages. To this end, members of the TCOA joined the Chamber of Mines, and formed a Chamber of Mines Collieries Committee, the functions of which

> "include all matters of mutual interest to its members and so far as it is possible the formation of a common policy, particularly in respect of conditions of employment, both of Europeans and Natives, industrial relationships, etc." (1946-47 Coal Commission:113),

and also dealt with health and safety issues, policy issues, and co-operative arrangements within the industry such as coal pooling arrangements. The Chamber was, from even before the founding of the Union, well-integrated into the governance of the mining industry; the Union's Department of Mines was essentially inherited from the Transvaal's Department of Mines, with which the Chamber had closely co-ordinated its activities. Thus the key features of this phase were a) the gold connection, b) the formation of cartels, and c) the dominant role played by the TCOA in controlling the market and pursuing the industry's interests with the state.

The second phase, from 1970 to the mid-1980s, was characterised by several developments. First, diversification of the electricity market (primarily through the growth of energy-intensive industry in the 1960s, and the takeover by Escom of responsibility to supply future demand growth in local authorities) undermined the gold industry's interest in selling cheap coal to Escom or others, since they were no longer the prime beneficiaries. Initially, the quest for high prices was pursued through the TCOA, but later through support for deregulation, which led to the demise of the TCOA in the mid-1980s. Second, a process of restructuring within the industry took place during the 1970s, whereby collieries, which had operated more or less independently within the context of the gold mining houses, were consolidated into tightly-structured corporate subsidiaries, and set up their own local and overseas marketing operations in the wake of the gradual demise of the TCOA. In the same period, ownership reached its maximum degree of concentration – at the end of the 1970s, just two mining houses accounted for two-thirds of the coal output in the Republic (Lang 1995:177). This in turn undermined the role of the TCOA in the export boom, which it had pioneered; export permits were given to individual mining houses rather than the TCOA, and to other new independent collieries (particularly multinational oil companies). Third, the export boom coupled with the static nature of the direct coal market led to a decline in importance of the TCOA's market, and fourth, deregulation in the mid-1980s

removed any rationale for its continued existence. Thus, by the end of this phase, the TCOA no longer existed, and the coal industry was represented in its interaction directly by individual companies, of which only two or three dominated the market.

The last phase in the development of the coal industry, from the end of the 1980s to the present, began with the removal of the last vestiges of state control (exports). The end of apartheid brought about a swift internationalisation of the coal industry, which finally divorced it from its traditional gold-mining roots. Resource multinationals specialising in base and energy minerals invested in the South African market, and dominant South African groups such as Gencor (subsequently Billeton (non-gold assets), and then BHP-Billeton) and Anglo-American began to diversify their assets internationally, which they had not been able to do under apartheid, and restructure their South African subsidiaries into international coal groups, thus structurally divorcing coal from gold interests.

2) The State

There have been four different types of institutional involvement in the coal sector by the South African state: regulation and governance of mining, regulation and governance of coal markets and exports, energy sector governance, and the involvement of the state in coal mining, marketing and consumption through state-owned enterprises, the most important of which were Sasol, Eskom, the railways and Iscor. At one point in the 1970s, although the state owned only a small part of the coal industry through Sasol and Iscor (now both privatised), state-owned enterprises consumed the overwhelming majority of coal produced.

Governance of the mining industry began in southern Africa with the Department of Mines in the Transvaal, which granted and policed mining rights and other mining-related regulatory processes. On the formation of the Union, the Transvaal mining bureaucracy was converted into a national department, and in 1912, was formed into the Department of Mines and Industries, which dealt with mining and resources, as well as issues arising from markets, trade and industrial development. The first state intervention in the industry was the imposition of grading for export, and later for domestic consumption, which was vested initially in a Grading Committee based in the Department, and then in the newly-created Fuel Research Institute (FRI), which also fell under the control of the Department. In 1933, a separate Department of Commerce and Industry was created, and the FRI was placed under the new department (operationally but not formally). Since the Institute's activities spanned both the assessment of coal resources and coal production on the one hand, and research into applications for coal on the other, this was a controversial decision which symbolised in many ways the institutional dilemma of coal governance and policy for the rest of the century.

The 1939 Committee of Inquiry into the Base Minerals Industry of the Union (1939 Base Minerals Committee) recommended that the FRI be transferred back to the Department of Mines to facilitate its work on coal resources. The report also contains a dissenting opinion which emphasised the strong link between the FRI's work and industrial applications and markets. The FRI was not moved, and was formally transferred to Commerce and Industry at the end of the 1940s, which was symbolic of the market-focused approach[37] to coal policy at the time. Two other events led to the strategic marginalisation of the Department of Mines in relation to coal policy; the first was the government decision to regulate the domestic coal price, which fell under the Price Controller in the Department of Commerce and Industry, as well as the regulation of coal exports, which was done in terms of the Fuel Research and Coal Act, as well as the War Measures (in terms of which price regulation had been introduced). The second was the development of coal-based parastatals which reported to the Department of Commerce and Industry, especially Sasol, which was established as part of the Industrial Development Corporation, also falling under the Department of Commerce and Industry, and a source of much of the state's strategic thinking on economic development from the 1950s onwards.

Stakeholder forums on which industry representatives served included the Fuel Research Board, which oversaw the FRI, and the Coal Advisory Board (CAB), which was set up in the wake of the 1946 Commission to advise the Minister of Mines on coal exports, especially coking coal, and other coal industry matters. The Fuel Research Board consisted of one representative each from the Natal and Transvaal industries (in reality, the TCOA and the NAC), one expert on the utilization of coal, and a representative from the CSIR[38]. The CAB consisted of representatives from the TCOA and NAC, the FRI, the Department of Commerce and Industry, Iscor, and the Geological Survey, and was chaired by the Government Mining Engineer. As discussed above, the FRI reported to the Department of Commerce and Industry, whereas the CAB reported to the Department of Mines, the institutional significance of which will become apparent below.

This institutional pattern lasted until the 1960s, when a sequence of coal policy-related institutional innovations began. The first of these was the Department of Planning, which was established in 1964 to facilitate the "co-ordination of economic and scientific planning in general" (Department of Planning Annual Report 1965:1), as well as facilitating co-ordination between the public and private sectors in development planning. The Department was the centre of a new planning process which produced, from 1964 to 1978, a detailed five-year 'Economic Development Programme', which was linked closely with the Economic Advisory Council, which advised the Prime Minister, headed by the Economic Advisor to the Prime Minister. The

[37] By contrast to a resource-focused approach: thus coal policy was pursued through regulation of the market until the 1970s, when it was approached from a resource development perspective.

[38] The composition changed several times; this composition prevailed after legislative changes in the 1950s.

Department of Planning also had responsibility for the CSIR and the Natural Resources Development Act, and specifically the Natural Resources Development Council, whose brief was

> "..to promote the better and more effectively co-ordinated exploitation, development and utilisation of the country's natural resources" (Department of Planning Annual Report 1965:7).

By 1971, the Department had begun work on two related fields which intersected with natural resources and planning. The Natural Resources Division of the Department was undertaking work to

> "..promote the optimum utilization of the Republic's mineral resources.. ..and to help formulate an integrated minerals policy for the country" (Department of Planning Annual Report 1972:7).

The Department also acted as secretariat to the Planning Advisory Council's Subsidiary Committee for the Optimum Utilization of Mineral Resources. The other field was energy; initially also within the Natural Resources Division. The energy work culminated shortly afterwards in the establishment of a dedicated energy section, which became the secretariat to the Energy Policy Committee (EPC), formed in 1974 in the wake of the oil crisis, which played a key role in coal policy-making in the 1970s and early 1980s. Department of Planning staff were instrumental in both the CAB's report on coal resources and the resulting Petrick Commission, which placed coal at the centre of the new focus on energy policy, and provided impetus for the establishment in 1975 of the Minerals Bureau within the Department of Mines, which was a synthesis of a number of other related functions in other departments, including the Department of Planning's Natural Resources Division. The Minerals Bureau had a brief to formulate a strategic approach to minerals utilisation, and to pay particular attention to coal.

This constellation of new institutional sites for coal policy was united in the 1980 civil service reorganisation into the Department of Mineral and Energy Affairs (DMEA), which took over responsibility of the regulatory functions of the Departments of Commerce and Industry[39], thus centralising all the institutional elements of the new coal policy paradigm in one Department, until 1987, when the National Energy Council (NEC) was created, and set up as a separate corporate-type organisation outside the formal civil service. The Fuel Research Institute was incorporated into the CSIR's energy research programmes in 1983, and these in turn were incorporated into the NEC in 1987. There was a concomitant shift in stakeholder forums. The new Coal Advisory Committee (CAC), created in 1985, broadened the traditional coal policy stakeholder forums from representation of the coal industry through the cartels to a group of

[39] The Department of Commerce and Industry was split in 1967 into two separate departments, and reunited in the 1980 reorganisation.

'producer representatives' including the TCOA, independent producers (including multinational oil companies, who were represented separately) and the Chamber of Mines, 'exporter representatives', 'consumer representatives' and 'distributor representatives'; the first act of the CAC was to advocate deregulation (Department of Mineral and Energy Affairs Annual Report 1987:71). The coal industry was represented on the NEC itself by Anglo American, the largest coal producer, but not as an official representative of the industry.

After deregulation, the state's coal policy activity was reduced to reserve estimates (carried out by the Minerals Bureau), and a massive research programme in the NEC, particularly on discard coal, which the export programme was producing in large quantities, but the state's withdrawal from the industry, the stagnation of the export industry in the late 1980s and the deregulation of exports in 1991 meant that the state had no context to implement any of the programmes, which were gradually scaled down and eliminated after the demise of the NEC in 1991. The intellectual property from the programmes was vested in a subsidiary of the Central Energy Fund (Enerkom), which was finally closed down in the early 2000s, after having failed to commercialise any of these technologies. As a result of deregulation and the shift in emphasis in energy policy away from coal, coal-related functions in the energy section of the DMEA were downgraded to a minor role. State coal-related policy activity in the late 1990s and early 2000s was limited to two areas: assessment of the coal industry and coal reserves by the Mineral Economics Directorate (the successor to the Minerals Bureau) of the DME, and as yet unfruitful attempts by the energy section of the DME to develop a coal discards and a low-smoke fuel[40] (for households) programme.

The Development of Coal Policy

The development of coal policy can be divided into four periods. The initial phase of the industry, roughly from the 1900s to the 1930s, was characterised by minimal state involvement, other than a role in promoting exports through imposing grading standards, as well as by the establishment of three of the four key parastatal consumers of coal: Escom, Iscor, and the state railways. The second phase, from the 1940s to the 1960s, was characterised by significant state regulation of the industry, specifically in terms of price and exports, and the beginning of concerns about the extent of coal reserves (initially for the steel industry), as well as the founding of Sasol. The third phase, the 1970s to the mid-1980s, begins with the release of a watershed report on coal reserves, which places coal policy in a different conceptual context; the regulatory system was significantly overhauled with a new set of aims in mind, and new institutions were

[40] To mitigate the negative health impacts of indoor coal use, as well as local air pollution, both of which are serious problems, especially in winter, in poor communities in coal-producing areas (where coal is affordable to poor households).

created; the state's synthetic fuels industry was dramatically scaled up, and the coal industry went through an export-driven renaissance. The fourth phase, from the mid-1980s to the present, was characterised by the state's rapid withdrawal from regulation of the coal industry, until by the early 1990s the state's only involvement consisted of monitoring and evaluating reserves. The main events and phases can be seen in context on the timeline in Figure 3.4 below.

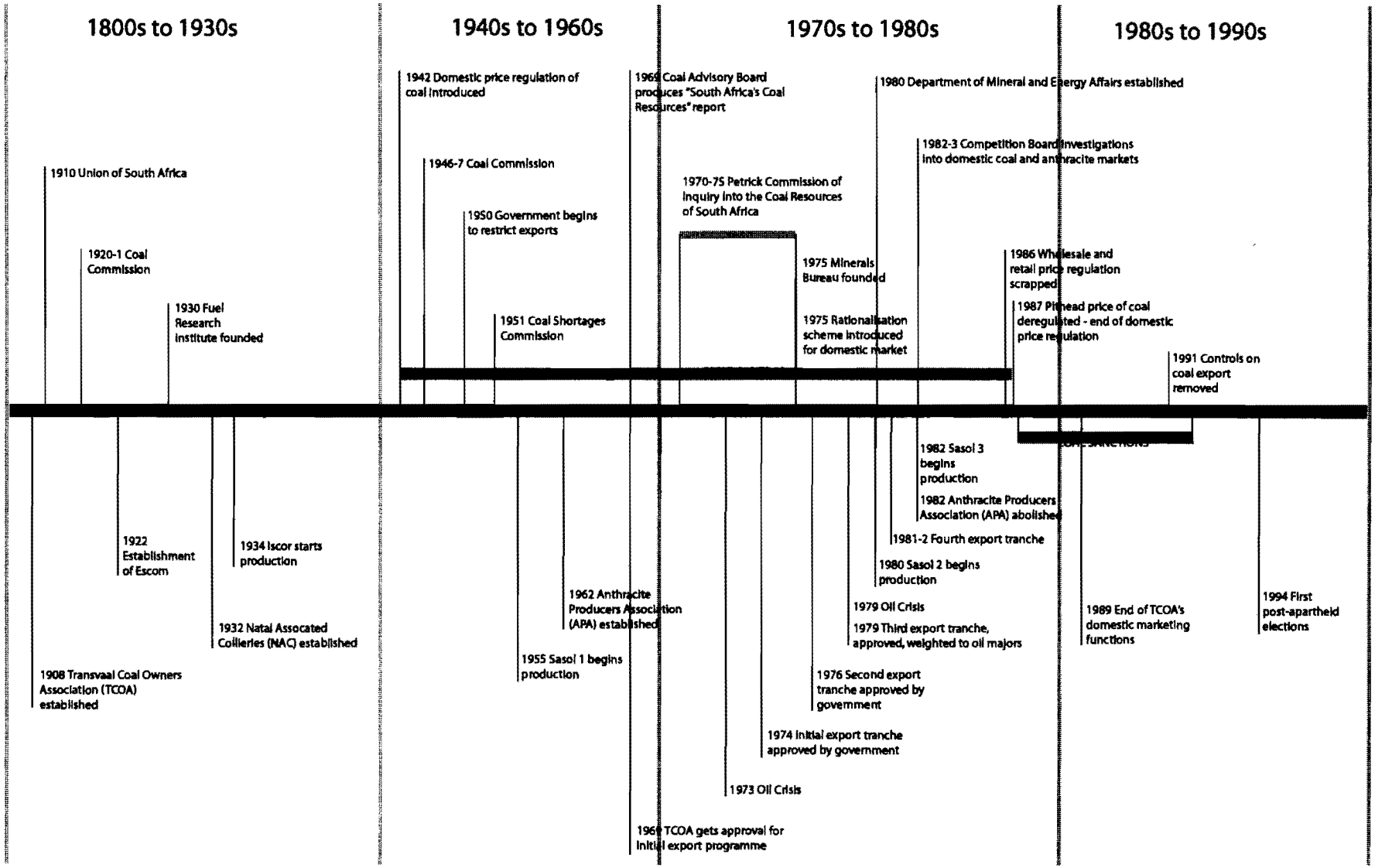
Major developments in the state's coal policy framework occurred through a series of Commissions of Inquiry from 1920 to 1975. Commissions of inquiry perform a number of useful functions for the state; amongst these is the central one alluded to by Vickers (1995) as a form of 'appreciative judgement', outside the usual context of the ordinary governance institutions, the outcome of which is usually a change not only in policy, but in the institutional framework for policymaking. Commissions were a favourite procedure for the South African state, and were applied when at least two conditions were met: 1) the state's interests would be furthered by public information gathering and consultation; and 2) existing state organisations were unable to accomplish the state's goals.

In the case of coal policy, the Commissions were particularly significant in that the majority of them provided conceptual frameworks and information not available within the normal state institutions which dealt with coal, and were often foci of shifts in policy and institutional structure. The key Commissions were the 1920 Coal Commission, which reported in 1921, the 1946 Coal Commission, which reported in 1947, and the 1970 Commission of inquiry into the Coal Resources of the Republic of South Africa (more commonly known as the Petrick Commission, after its Chairperson), which reported in 1975. Other inquiries which were important were the 1937 Committee of Enquiry into the Base Minerals Industry of the Union, half of which was devoted to coal, the 1951 Commission of Enquiry in regard to Coal Shortages, triggered by the coal shortages of the late 1940s, and a key report of the Coal Advisory Board, published in 1969, South Africa's Coal Resources, which led directly to the appointment of the Petrick Commission. These commissions, and particularly the key commissions referred to above, constituted important decision points in the evolution of coal policy. Unlike most other areas of the energy sector in South Africa, these were largely a matter of public record.

1) 1900s to 1930s

The first Commission, signalling the first interest in the governance of the coal industry as a whole by the Union government, was appointed in 1920, under the chairmanship of Robert Kotze, the Government Mining Engineer, who had previously held the same position in the Transvaal before unification. Kotze was also centrally involved in the decision, taken at around the same time, to establish a state-owned electricity utility. The Commission had two basic tasks:

Figure 3.4: Key Policy-related Developments in the Coal Sector



the first was to find ways of safeguarding the nascent export industry by finding ways to introduce coal grading for export coal (thus improving South Africa's reputation as a reliable supplier), and of improving logistical arrangements for coal pooling by mines to facilitate exporting and to prevent the export of low-grade coal (which the state saw as a threat to the credibility of the export trade). The second was to investigate ways in which the internal market could be assured of a reliable supply of coal, including state-run entities such as the railways, as well as municipalities and non-mining industries, since the logistical problems (mainly linked to mismatches between production, transport and demand) of the coal industry tended to produce periodical shortages (1920-21 Coal Commission:1); thus,

> "..when there is a shortage of trucks, it is more remunerative to the collieries to utilise the trucks for export coal.. ..while there is a brisk business in export trade, there is little inducement to the collieries to cater for the less profitable portion of the trade, which is consequently liable to get somewhat short of supply" (1920-21 Coal Commission:28).

The resulting legislation set in motion co-operation within the industry for pooling arrangements, established Grading Committees for export coal, and required that all coal for export and bunkering be graded. The Commission also noted that

> "..should the occasion, however, arise, whether from some interruption in the normal output of the collieries or from the undue attention of the collieries to a profitable export trade, we think the Government should have the right to intervene by prohibiting or curtailing the shipment of coal so as to compel coal owners first to supply the internal requirements of the country" (1920-21 Coal Commission:24).

This was a central feature of coal policy for the next 60 years. Legislation empowered the Minister of Mines and Industry to prohibit exports when there was a "real or apprehended scarcity" (Coal Act 27/1922), as well as empowering the railways to commandeer coal supplies at an "arbitrated price" if they lacked locomotive coal. The grading process was placed on a more formal footing with the establishment of the Fuel Research Institute (FRI) in 1930, whose function was to

> "study and investigate the fuel resources of the Union, grade coal for export or bunkering, and to undertake scientific and technical research on all matters relating to fuels in general and to fuel by-products" (Fuel Research Institute and Coal Act, 36/1930),

which included taking over the grading functions of the committees. The Institute was governed by a Board, on which were represented Transvaal and Natal coal producers, and reported to the Department of Commerce and Industry (rather than the Department of Mines).

An added complexity of the coal market in the 1930s, and the main source of the state's initial strategic interest in total available coal resources, was the establishment of a large-scale state-owned iron and steel industry (Iscor), which began manufacture in 1934, and required reliable

sources of coking coal, which at the time was believed to be in short supply. The question of the absolute availability of coal resources, as opposed to the more predominant question of their efficient and equitable distribution, was raised in terms of coking coal only; the first government body to consider the question, the 1939 Committee tasked with reporting on the 'Base Mineral Industry of the Union', was disturbed to find that the question could not be answered (see above). A key turning point institutionally was the outcome of a debate in the Committee, which hinged on whether to locate the FRI in the Department of Mines or the Department of Commerce and Industry, as to whether coal policy should be developed in an industrial context (emphasising industrial development based on coal) or in a resource context: the outcome (with one dissenting opinion), was in favour of the industrial context.

2) 1940s to 1960s

Coal policy from the 1940s to the 1960s was dominated by a concern with the availability of cheap coal on the domestic market, as an input into the fairly rapid process of post-war industrialisation, also aided by the completion of the nationalisation of the electricity industry and various state-driven initiatives to expand the use of low-grade coal, primarily through the Industrial Development Corporation. The first step which was taken in this regard was the regulation of the coal supply chain, including a specified maximum price for coal at the pithead. This was done in 1942, initially as a war-time measure, which was later extended and entrenched in subsequent legislation. This approach to coal policy was accompanied by an institutional shift which effectively brought the industry under the control of the Department of Commerce and Industry.

The 1946 Coal Commission

The focus of this transition was the 1946 Coal Commission, which was given three broad goals. The first was to investigate the problem of coking coal, assess whether there was likely in fact to be a shortage of locally produced coking coal, and what should be done about this. The second was to investigate whether grading standards, which were compulsory for export coal but voluntary for the domestic market, should be altered to allow more coal to be sold, and the third was to report on

> "any further measures necessary to secure the greatest amount of utilisation of the coal resources of South Africa" (1946-47 Coal Commission:1).

The resolution of the coking coal problem required a considerable shift in thinking about coal resources, which in turn required the Commission to systematically assess the country's coal industry and resources as a whole. The Commission noted that their investigation would extend to all grades and types of coal, and that existing data was inadequate for this purpose (1946-47

Coal Commission:27). In this context, the Commission built its conclusions concerning both coking coal and utilization of coal resources in general. Coking coal was not found to be in short supply; in this regard, the Commission recommended two measures. The first was a set of negotiated agreements between Iscor and coke producers[41]. The second was the establishment of a Coking Coal Advisory Board, to advise on coke exports[42]. The agreements were in fact concluded, and the Coal Advisory Board was set up to advise the Minister of Mines on a range of coal-related issues, including the export of coking coal (see above).

As regards coal grading and marketing, the Commission pointed to a number of problems but did not see a need to address these problems through regulation or the extension of obligatory grading to domestic coal, strongly recommending that the industry be left to police itself inside the country in terms of structure and quality, which was not surprising, since the final report was apparently drafted by a senior figure in the industry (Lang 1995:129); the commission rejected any suggestions by some industry players that the industry structure was monopolistic. Another theme in the Commission's report was coal wastage caused by selective mining of high-grade coal and bad mining practices (1946-47 Coal Commission:97-106).

The reason for these practices was the narrowly-specified grading criteria, making it worthwhile only to mine high-grade coal, therefore leading to the underutilisation of coal resources and the sterilisation of low-grade seams, as well as the dumping of low-grade coal for which there was no immediate market. The Commission did not regard these concerns as serious enough to warrant intervention, stating that

> "..it has been shown that there is no cause for the least apprehension that reserves are insufficient to meet all probable future requirements for a very lengthy period of time" (1946-47 Coal Commission:106).

The solution was the exploration of further uses for low-grade coal, which was significantly underutilized at that point; the Commission wrote glowingly about the prospects for a synthetic fuels industry in South Africa (1946-47 Coal Commission:94-97); a state-owned synthetic fuel corporation was launched the following year under the auspices of the Industrial Development Corporation, which manufactured synthetic fuels on a relatively small scale, but making significant use of low-grade coal, and creating a technological precedent and capacity for a later large-scale project.

Another area of policy which was addressed by the Commission was the question of coal exports. In the context of regulated domestic prices which were so low that these were "..the envy of every visiting industrialist" (Lang 1995:127), export prices, which were often several

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[41] Iscor subsequently became involved in the coal industry itself.

[42] Coking coal was then being exported as high-grade steam coal, which was deemed a waste of a scarce resource at the time.

times higher, were an incentive to concentrate on the export trade to the detriment of the domestic market. This meant in practice that there was a degree of cross-subsidisation between the export and domestic markets. As the Commission noted,

> "..a further difficulty may present itself in the near future due to the possibility of some colliery companies concentrating on the shipment market only.." (1946-47 Coal Commission:130),

thus undermining the cross-subsidy process, and disadvantaging collieries which produced for the local market at what was effectively a subsidised price. Thus, the Commission recommended that

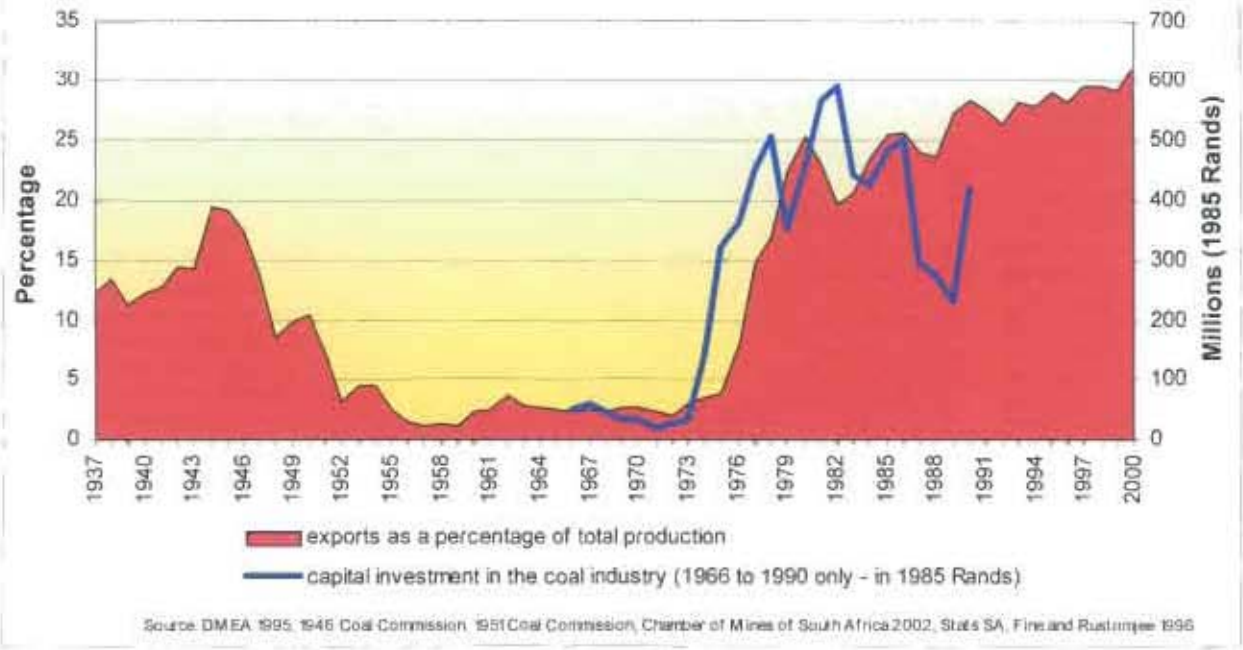
> "..in the event of collieries concentrating on the export market only whilst inland prices are controlled, action should be taken to regulate coal supplies for shipment purposes.." (1946-47 Coal Commission:130).

This recommendation the government accepted, and began using its powers to control coal exports from 1950 as a way of compelling coal companies to produce for the inland market (Financial Mail 21/12/1973). Exports of coking coal were generally prevented. Coal exports also suffered from severe transport bottlenecks, often leaving export orders unfilled (Lang 1995:133), and undermining South Africa's reputation as a reliable supplier. Transport bottlenecks also frequently resulted in domestic shortages, both for direct users and for power plants, which resulted in a 1951 Commission of Inquiry (1951 Coal Shortages Commission) to examine ways in which future supply problems could be resolved. A combination of these factors and the global substitution of oil for coal in the post-war decades led to a stagnation in the export trade until the early 1970s.

Price Regulation and the Domestic and Export Markets

Because of the factors mentioned above, the regulated coal price in the 1950s and 1960s was extremely low. In addition, government sought to encourage industrial development through cheap inputs, and the Price Controller in particular saw price control as a way to combat inflation (Financial Mail 15/12/1967), which became the dominant framework for considering price increase requests from industry in the 1960s. The low domestic price of coal was regulated according to a succession of rate-of-return formulae which were calculated without taking into account sufficiently the impact of inflation (Financial Mail 27/11/1970). Price increases were granted on an ad-hoc basis by the Price Controller, based in the Department of Commerce and Industry. While this system was tolerable to industry during the 1950s, inflation, which had averaged 2% in the 1950s and 4% in the 1960s, began to erode profit margins significantly in the late 1960s, and particularly from the early 1970s on, when there was a massive increase in inflation (which averaged 12-15% during the 1970s). A combination of stagnating domestic

Figure 3.5: Coal Exports as a % of Total Production, and Coal Capital Expenditure



Source: DMEA 1995, 1946 Coal Commission, 1951Coal Commission, Chamber of Mines of South Africa 2002, Stats SA, Fine and Rustomjee 1996

prices and a static export trade during this time combined to turn the coal industry into a stagnant industry by the late 1960s, in which there was very little inward investment, and no significant technological progress. Large long-term contracts which were not conducted through the marketing organisations were usually concluded on a 'cost-plus' basis, using the controlled price as a reference point; in reality, parastatals such as Escom usually bought coal at below the regulated price. The previous consensus on price regulation was abandoned, and the coal industry lobbied for its removal in the late 1960s and early 1970s.

The export trade declined as a percentage of the total tonnage mined until the 1970s (see Figure 3.5 above); more seriously, this represented a significant decline in value, since exports fetched far higher prices and even higher margins than coal sold on the domestic market. For instance, in 1950 the TCOA supplied 19.5 million tons to domestic consumers, and exported only 1.2 million tons; however export sales yielded 46% of total profits in that year (Lang 1995:133). Demand for South African coal had intensified after the war, when industrialised economies recovering from the war experienced significant production bottlenecks, but faded soon after as coal production elsewhere expanded and recovered, and these economies underwent a decisive shift to oil; traditional markets for South African coal such as the Far East disappeared as other producers (such as Australia) emerged and the structure of the international coal market changed. Severe transport bottlenecks, mentioned above, from the late 1940s, added to the difficulties of exporters, and the traditional South African coal marketers (acting on behalf of the TCOA), the shipping company Mann George, found it increasingly difficult to find new markets in the face of the unreliable transport system as well as increasing international hostility to South Africa (Lang 1995:151).

In addition to the reasons outlined above, a central factor in inhibiting exports was government policy, which after 1950 had imposed significant controls on exports, for two reasons. The first was an attempt to conserve metallurgical coal resources[43], and the second was based on supply concerns for the domestic market, since at that stage the domestic market overlapped considerably with the export market in terms of the kind of coal in demand. The domestic market was also growing at an alarming rate, since almost all the country's primary energy requirements were being met by coal (there was almost no substitution of coal by oil). Exports were subject to permits, and discouraged, as recommended by the 1946 Commission, unless collieries produced significant quantities for the domestic market; thus, dedicated export projects were eliminated, and the focus of the market turned inward.

Thus by the end of the 1960s, coal policy was determined within a narrow framework focused conceptually on the domestic market, and institutionally based in the Department of Commerce and Industry, which regulated the domestic price, promoted industrialisation based on cheap coal, and controlled coal exports. The owners of the coal industry were no longer as interested in low coal prices as they had been in the 1950s, since gold mines formed a far smaller proportion of the direct or indirect coal market than they had in 1950. In addition, dramatic increases in the gold price in the early 1970s meant that rising input costs could be easily absorbed by them, but not by the coal mines. These changes formed part of a significant transformation in the coal industry, which began in the late 1960s with three developments. First, coal beneficiation was pioneered in the late 1960s, involving the processing and differentiation of a more complex range of coal products from each deposit; second, on the basis of this, new internal and external markets were opened up, with huge potential earnings, and third, a gradual revolution in coal-mining techniques was taking place. Traditionally, in common with most South African industry, coal mining was relatively labour-intensive on account of extremely low real wage levels until the 1970s, when both inflation and worker activism put upward pressure on wages.

In this context, a committee operating under the auspices of the Coal Advisory Board produced a landmark report in 1969 which claimed that coal reserves in South Africa were not as extensive as traditionally imagined, and would be exhausted within a few decades (Coal Advisory Board 1969). The committee actually formed part of the natural resources planning machinery of the Department of Planning, and its chair, Van Rensburg, was responsible for establishing both minerals and energy planning functions in the Department. This had several effects. Firstly, it caused significant alarm within government, which had since the early 1960s been very concerned with the possible strategic impact of an international oil embargo. The prospect of indigenous coal resources, the backbone of the energy economy which until then everyone had

[43] These had been exported as high-grade steam coal previously.

assumed were effectively limitless, running out in less than half a century was very disturbing, especially given the strategic option of dramatically scaling up the coal-based synthetic fuels programme. Secondly, and possibly more significantly, it placed coal policy debates in a completely different conceptual context, and shifted the fundamental focus from regulation of the internal market to the question of strategic resources. The sentiments of the report had been expressed the year before by the President of the Chamber of Mines, who had warned that

> "..the controlled coal price in South Africa, possibly the lowest in the world, forced the industry to mine selectively; compelling a mining policy that was threatening the potential life of the country's coal reserves.." (Lang 1995:150).

This view was now endorsed by state officials. The coal industry wasted no time in perceiving the opportunities which would flow from this shift, for which they had begun to lobby. The chairperson of the TCOA commented that

> "..this is an astonishing change of opinion for the country, a country which has met its great growth in demand for energy almost exclusively from its large coal reserves.." (quoted in Financial Mail 24/10/1969).

The Financial Mail expressed the hope that the Price Controller would

> "..recognise the industry's new 'scarce resource' and 'manufacturing' status, and allow it some extra reward in consequence.." (Financial Mail 24/10/1969).

The shift in emphasis placed resource conservation, rather than cheap industry inputs, at the centre of coal policy, and began to place it in a broader energy context. Symbolically, this shift was expressed neatly by the chairman of Sasol, the effective centre of the state's strategic oil policy, who stated in 1970 that

> "..it is time that we approached our coal reserves, not from the restricted viewpoint of a series of small mines, but from a broad national point of view.." (quoted in Financial Mail 19/6/1970).

3) 1970s to mid-1980s

The state, lacking the institutional capacity to develop a coal policy based on strategic resource use, and convinced by the CAB report that existing methods of estimating coal reserves and forecasting demand were inadequate, resorted to another Commission of Inquiry, which was appointed in 1970.

The Petrick Commission

The full title of the Commission was the "Commission of Inquiry into the Coal Resources of the Republic of South Africa", but it is better known by the name of its chairperson, Dr A.J. Petrick, head of the Fuel Research Institute for over two decades, and, crucially, assisted by Dr Van

Rensburg. The Commission was to consider, within the context of available energy resources, whether coal resources needed to be conserved, if necessary how this could best be brought about, and what controls would have to be placed on the industry to facilitate this (1970-75 Coal Commission:i).

The Commission took around five years to complete its investigations, during which time the 1973 oil crisis occurred, which drastically changed both the international energy environment and the local strategic outlook. Crude oil increased dramatically in price, and South Africa faced the threat of having its oil supplies cut off. The government took the decision to scale up the synthetic fuels programme, thus placing an addition demand on future coal reserves. The Commission's Report was novel in that it considered for the first time in South Africa the question of *energy supply and demand as a whole* in evaluating the potential demand for coal in the foreseeable future.

This itself involved a number of conceptual innovations in calculating coal reserves, in particular a) drawing meaningful distinctions between resources (in situ coal), potential reserves and economically recoverable reserves of different classes of coal, b) standardising these definitions for different mines (which had not been done before, even in the 1969 report), and c) developing a reporting system and a data-processing system in order to accomplish this. In addition, the Report depended on a number of forecasting techniques which explored both technological and economic developments in the coal industry as well as models of future energy demand. Using these assumptions, the Report predicted that coal production would peak around 2025 and decline rapidly thereafter, implying that South Africa had a significant long-term energy problem (1970-75 Coal Commission:75). The report concluded that

> "..it is therefore essential, in order to avoid a situation where South Africa might become largely dependent on imported energy-carriers early in the next century, that all possible steps be taken to conserve our coal" (1970-75 Coal Commission:79).

These steps consisted of two main measures: 1) a change in government decision-making processes on energy-related policy issues, and 2) more efficient use of existing coal resources. The first significant recommendation regarded the establishment of an "Energy Planning and Co-ordinating Board" to

> "advise on the detailed implementation of these recommendations. Its major objectives should be to advise on the supply, conversion and use of energy in the widest sense, with special emphasis on the widest possible use of all available energy sources" (1970-75 Coal Commission:191).

The Commission identified coal as the only significant long-term domestic energy source[44]. Thus, decision-making processes regarding coal policy should be shifted into a much broader energy policy framework.

The second aim could be achieved by two methods. The first was to overcome the "cheap energy" paradigm which had underpinned the development of the South African economy, which would curtail demand, and included the advocacy of energy conservation, and the second was to investigate methods of improving the extremely low utilization rates of coal resources in South Africa, which consisted in encouraging or enforcing higher extraction rates:

> "..the most significant loss of primary source energy in the Republic arises from the poor degree of recovery in mining coal from its seams" (1970-75 Coal Commission:155).

Another significant form of loss was inefficient coal processing or marketing, where high-ash, low-value coal was discarded, or high-grade coal from "captive collieries" (collieries where coal output is entirely fed into a mine-mouth plant) is fed into boilers or gassifiers with low-grade coal for which the plants are designed. The reason for this low recovery rate was identified by the Commission as "..the present system of price control" (1970-75 Coal Commission:191), which

> "flows from the popular 'cheap energy' policy which, until recently was the fashion not only in South Africa but in most other industrial countries" (1970-75 Coal Commission:191),

which set the pithead price of coal too low to allow for new investment and higher extraction rates. The Commission recommended that in exchange for higher prices,

> "..there should be a greater measure of Government control with regard to permissible mining practices, permission to open new mines, rationalisation of mining operations, reclamation of the surface, and control over the marketing of coal" (1970-75 Coal Commission:191).

The submission of the Chamber of Mines (published alone as an Annex to the report), at this point representing almost the whole coal industry, asserted that

> "..the setting of the coal price was a fundamental and all-pervasive influence on the technical structure and development of this industry" (1970-75 Coal Commission:199).

They also asserted that inland price control and "co-operative selling" was necessary, since

> "free competition would tend to stimulate maximum production from the best quality and most cheaply mined coal seams first without regard to conservation" (1970-75 Coal Commission:199),

[44] The Commission rejected uranium, which is found in South Africa in abundance but in relatively low-grade deposits, as too limited an energy source in the absence of breeder reactors.

but required that the price-setting process be removed from the Price Controller, since the Department of Commerce lacked the necessary technical competence to evaluate the impact of pricing policies on mining practice. This technical competence

> "may be available in the Department of Mines [but] there is no evidence that this latter Department has been afforded the opportunity to make a meaningful contribution to the pricing of coal" (1970-75 Coal Commission:200).

The Commission also took a stance against encouraging coal exports, regarding a large-scale export programme, particularly of metallurgical and high-grade steam coal, as counter to the national interest (1970-75 Coal Commission:191-192).

The policy shifts which took place in the wake of the report, and set the tone for coal policy generally until the mid-1980s, can be classified into three interrelated areas: institutional changes and innovations, domestic market policy, and export policy. These developments, including high real price increases granted in the mid-1970s, coupled with the international revival of the coal industry in the wake of the oil crisis and the rapid development of the export industry turned the industry's fortunes around; the coal industry shifted from being "mining's Aunt Sally" (Financial Mail 24/10/1969), and a "Cinderella industry" (Financial Mail 27/11/1970) which even senior figures in the mining industry advised investors against investing in (Financial Mail 27/11/1970), to being "the top performer on the JSE" in 1976 (Financial Mail 22/4/1976). George Clarke, later Chairman of General Mining, which with Anglo American in the 1970s dominated the coal industry, said in 1970 that

> "..if our Cinderella industry gets half a chance to escape from the ugly sisters of excessive control and inadequate transport, it could have quite a ball" (Financial Mail 27/11/1970).

This it proceeded to do.

Institutional Changes and Innovations

The Petrick Report contributed to a confluence of different developments in state thinking on South Africa's mineral resources, which centred on a broad state-driven energy-intensive beneficiation strategy, coupled with a new post-1973 strategic perspective on South Africa's position in the world minerals industry. The paradigm shift in coal policy, from a narrow concern with controlling the domestic coal market to assessing and managing coal reserves as a national resource, required a capacity which had been assembled for the purposes of the Petrick Commission, but was lacking in the state otherwise; in a similar fashion, it was lacking in other minerals industries. The Department of Mines was dominated by a narrow technical approach to mining, which lacked a broad policy function. While it contained expertise in fields such as occurrence of mineral resources (the Geological Survey), mining processes, and health and safety issues, it lacked any meaningful capacity in economic or policy analysis, which in terms

of the minerals industry was based in an embryonic unit in the Department of Planning and the Environment (the Natural Resources Division), as part of the general economic planning function which advised the Cabinet. There was thus no institutional structure which could easily do the kinds of analyses which related mineral reserves to national and international markets and requirements, and attempted to develop appropriate strategies for these, as well as other national strategic goals.

This changed in 1975 with the formation of the Minerals Bureau in the Department of Mines, headed by Dirk Neethling, later the state's chief energy bureaucrat, as head of the DMEA's Energy Branch, and subsequently the National Energy Council. The aim of the Bureau was to

> "..advise on the formulation of realistic government policies to ensure optimum utilisation of South Africa's mineral resources" (Department of Mines Annual Report 1975:58).

This strategic role strengthened towards the end of the 1970s, as the state began to see its position in the global minerals market as a form of leverage against various forms of sanctions[45], as well as a valuable source of foreign exchange, especially as the rand began a steady decline against the dollar towards the end of the 1970s. In 1978, the Director of the Minerals Bureau reported that

> "..it is evident that an appropriate mineral policy must not only provide for domestic self-sufficiency and contribute to national economic and social development, but that it should also ensure that South Africa continues to be one of the leading mineral producing and exporting countries of the world. The international mineral trade has, however, become entangled in a web of political and strategic relationships, thus adding to the complexity of forecasting developments in the years ahead.." (Department of Mines Annual Report 1978:47).

The way in which this was achieved was to assemble officials from a number of state agencies, including from the Economics and Costing Division of the National Institute for Metallurgy, the Geological Survey, the Government Mining Engineer's Office, and the Natural Resources Division of the Department of Planning and the Environment (Department of Mines Annual Report 1975:59), as well as creating extensive networks with state mining and planning agencies, and the mining industry, a procedure which was repeated with the formation of the Energy Branch of the DMEA by Neethling in 1980.

In addition to this, the Bureau also put in place a network of overseas representatives in key locations, either in countries which were key trading partners or competitors (these included at different times Iran, Australia, Chile, Germany, Japan, the USA and others); Minerals Bureau

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[45] The apartheid government sought to exercise pressure to prevent traditional Western allies (particularly the US and the UK) from taking hostile stances to apartheid by highlighting the extent of South Africa's reserves of strategic metals and other minerals; in many cases, the only other significant deposits were found in the Soviet bloc.

staff attended key international minerals conferences. Both these activities served as intelligence gathering exercises, as well as furthering another of the Bureau's aims, which was to promote South African minerals exports abroad, including coal.

The Bureau was structured into separate clusters of minerals, including an Energy Mineral Division, which was responsible for "the Minerals Bureau's contribution towards the formulation of national energy policies" (Department of Mines Annual Report 1975:61). In theory this included all "primary sources of energy", but as this and subsequent reports and other records of activities indicated, there was only one real focus, which was coal. Other primary energy minerals were actually responsibilities of other state agencies at the time; the Bureau was clear in its 1975 report that it would not be investigating uranium reserves and policy since this was the responsibility of the Atomic Energy Board (Department of Mines Annual Report 1975:62). Similarly, the Bureau's activities as regards potential oil and gas resources were restricted to speculation based on reports from Soekor, the state's oil and gas exploration and licensing agency.

The function of the Minerals Bureau in this regard was to continue the work of the Petrick Commission on an ongoing basis, in compiling and analysing data on coal resources and reserves, production, demand and prices, and advise a range of state agencies on the development and implementation of coal policy, including a range of policy issues including energy policy issues, coal exports and market regulation. Their scope of activities included

> "..aspects of coal economics such as coal mining methods and technology; the efficiencies of recovery in South African collieries; costs of coal production; labour, finance, equipment and infrastructure requirements for coal production; coal pricing and marketing policies; the preparation, transportation, distribution and utilization of coal; the effects of coal prices on the national economy, and the environmental effects of coal production" (Department of Mines Annual Report 1975:61).

Between 1975 and 1980, the Minerals Bureau was involved in advising the Department of Commerce on (and liaising with private mining companies concerning) export quota allocations, promoting the growth of the coal export market, advising the Coal Allocation Committee which arose from the 1975 supply crunch, advising on coal price regulation, providing forecasts of coal production and demand, and interacting with the government's nascent energy planning processes then based in the Department of Planning and the Environment. In 1979, the Director stated that

> "..the Minerals Bureau has, since its establishment in 1975, given priority to the creation of the necessary supporting structure to enable it to perform its primary function, *viz. to advise the Government on the formation of an appropriate and feasible minerals policy*" (Department of Mines Annual Report 1979:55).

What was missing was a mechanism to interact with the private sector, which effectively controlled the minerals industry. The Bureau was thus instrumental in proposing and establishing the Minerals Policy Committee (MPC), officially appointed by Cabinet in 1980, an advisory body consisting of representatives of government and the mining industry, and functioned as its Secretariat, providing detailed support and policy input. The MPC was formed in the wake of the 1979 'Carlton Conference[46]', the watershed summit between the newly-appointed premier P W Botha and South Africa's business elite which set the tone for a new pattern of governance and policymaking in the 1980s, and was echoed in the reformulation of the Energy Policy Committee at around the same time (see Chapter 7). The MPC's function was to

> "..keep the Government informed, and to advise it on all facets of the minerals industry, including the formulation of an appropriate minerals policy.." (Minerals White Paper 1986:2).

Amongst other things, the MPC was tasked with the drafting of a Minerals White Paper, published in 1986, with secretariat and research services provided by the Minerals Bureau. The specific coal-related functions of the MPC stemmed from their focus on developing minerals exports; the MPC formed a central component in the process of formulating new export permit conditions for Phase IV of the export programme in 1981 (Department of Mineral and Energy Affairs Annual Report 1981:64).

The other pillar of the new energy policy system in the 1970s was the Energy Policy Committee (EPC – see Chapter 7), which was set up hastily following the oil crisis. The EPC was attached to the Department of Planning (which served as its secretariat), and advised a Cabinet Committee on energy policy issues. Amongst other issues, the EPC considered and advised on the Petrick Commission's Report, coal export allocations, and the decisions to scale up Sasol. Both the energy section of the Department of Planning and the Minerals Bureau were centralised in the civil service reorganisation of 1980 in the Department of Mineral and Energy Affairs. The central rationale for the formation of the DMEA was an integrated approach to coal from an energy point of view; what it reflected was the completion of the shift from a regulation-based to a resource-based form of policymaking. The new head of the Energy Branch, Dr D C Neethling (previously founding director of the Minerals Bureau) stated in the DMEA's first Annual Report that

> "..for the first time in the history of the public administrative system in South Africa all energy related functions are not only housed in one and the same department, but are housed in a department which is responsible for both the energy and the minerals policy of the

[46] Named after the Carlton Hotel where the conference was held, a central symbol of modernity in 1970s Johannesburg, and symbolically near both the headquarters of the major mining houses and the Johannesburg Stock Exchange, then in the midst of a gold boom.

country. Since coal is South Africa's most important source of energy, for the present as well as for the foreseeable future, the combination of the energy and minerals functions is of great importance for effective determination of policy by the Government on a co-ordinated basis" (Department of Mineral and Energy Affairs Annual Report 1980:71).

Although the coal regulatory functions had been brought into the Energy Branch, the coal-related functions of the Minerals Bureau were not, which lent the Bureau a prominent role in coal policy for the next decade or so.

Domestic Market Policy

There were two aspects of coal policy as regards the domestic market in the 1970s and 1980s. The first concerned the regulation of the pithead price of coal, which affected the economics of the industry generally; the second concerned the regulation of the wholesale and retail industry, which affected only the market for direct coal use, and excluded large users which consumed over a certain tonnage (such as Escom). The wholesale and retail industry diminished in importance throughout this period in relation to the rest of the market.

The state's rationale in the 1970s for the regulation of the wholesale and retail markets was based on security of supply concerns, the protection of certain classes of small consumers which coal merchants often found inconvenient to supply, and a policy of promoting the replacement of liquid fuels consumption in industrial applications with coal. The penetration of liquid fuels into the traditional coal market in the 1960s was not, as in other countries, driven by price (since coal was much cheaper), but by superior marketing and ease of use; thus, with the added price advantage of coal in the 1970s, the trend could be reversed by a) increasing the sophistication of the market, and b) enforcing quality standards in product, sales and service (Lang 1995:151,160), and thus contribute to 'de-oiling' the economy post-1973.

Supply problems were generally caused by transport bottlenecks which had recurred periodically since the 1940s, and been partly alleviated in the 1960s by the introduction of road transport[47], which involved a complicated cross-subsidy in the form of a 'Road Transport Levy' to 'level the playing fields' between coal producers which depended on road and those which depended on cheaper rail transport (Competition Board 1983:13, Financial Mail 19/11/1965). The 1973 oil crisis also triggered a reverse of the substitution of fuel oil for coal which had occurred in the 1960s, which added to the logistical problems. By 1975, there were significant winter coal shortages, as a result of the usual logistical problems as well as a real supply shortage, which was alleviated by significant investments in new capacity taking place at the time.

[47] Previously the railways had a legal monopoly on bulk coal transport.

The shortages were managed in two ways. A Coal Allocation Committee was established, consisting of representatives of industry and government, to identify bottlenecks and tackle them in advance; and a new 'rationalised' regulatory system was introduced for the domestic market, part of the aim of which was to combat what the state and the cartels saw as a form of market failure: the lack of coal stockpiling facilities. The CAC was set up specifically to deal with the mid-70s shortages, while the rationalisation system was implemented gradually from the early 1970s onwards. The rationalised supply chain would place obligations for stockpiling on various parts of the chain, thus avoiding supply problems which resulted from the mismatch between supply and demand inherent in the industry: 60% of coal demand occurred in only four winter months, thus,

> "..mines would be unable to supply the right quality and size if industry had to be supplied only directly from the mines.." (Competition Board 1983:5).

The supply chain had since the 1940s been regulated at the pit-head and at the merchant level for coal with less than a certain calorific value; the state's and the industry's concern was that price control combined with "over-trading amongst coal merchants" (Competition Board 1983:13) had led to a decline in service levels from merchants to consumers, which contributed to the switch to petroleum products (which had more sophisticated marketing operations) during the 1960s. This became a concern to the post-1973 apartheid state, eager to both provide energy security and minimise dependence on imported oil. The renaissance of coal use amongst small-scale users became another element in the apartheid state's attempts to de-oil the economy, and thus security of supply became paramount.

The solution to these problems, which was implemented from 1973 onwards, was a two-dimensional strategy. The first involved regulation of prices in the supply chain at four levels, namely producers, wholesale agents (who buy direct from producers), merchants (who buy from wholesalers and also retail to the general public) and dealers (small retailers who buy from merchants) (Competition Board 1983:16), and the second involved the reorganisation of the distribution industry, which was accomplished with the active involvement of the industry, notably the TCOA and NAC, who effectively merged their marketing operations for a period in the mid-70s. Although large consumers such as Eskom concluded long-term contracts directly with producers, these two marketing organisations comprised what was virtually a monopsony in the early 1970s. As a result, the state could utilise their role in the industry to effectively reorganise the whole supply chain for the domestic market.

In fact, the TCOA decided on the details of the scheme and implemented it. According to the Competition Board,

"..the actual implementation of the plan was left to the marketing organisations which were actively backed by the Government" (Competition Board 1983:14).

The scheme consisted of a number of steps. The first was the consolidation of 'wholesaling', which was defined as selling coal in rail truck loads (excluding that sold by the TCOA or NAC). Wholesalers were able to add a commission per ton fixed by the Price Controller. Existing wholesale operations were grouped together into two entities having exclusive access to two regions excluding Natal (where the NAC effectively prevented wholesaling); the TCOA had significant shareholdings in both wholesalers. All consumers using less than 100 000 tons would be obliged to buy coal from the wholesalers (and thus to pay the commission) ("other than those companies that had affiliations with TCOA's mining-house members" (Competition Board 1983:14)). At the retail level, the TCOA decided which marginal markets were "over traded". In these markets, the wholesalers' staff chose one or two "of the most promising" merchants, and supplied only them; other merchants were obliged to buy coal from these merchants. In areas with high levels of competition, government demarcated areas in which merchants could trade, in which they were given exclusive rights (Competition Board 1983:15-16).

The 'rationalisation' scheme was as a result implemented by a combination of regulation (prices) and a complex set of agreements with key players, as well as the crucial exercise of market power by the dominant suppliers (the TCOA and NAC). Much of the scheme was thus from a policy point of view implemented informally. These conditions began to break down towards the late 1970s, ironically because significant independent producers entered the domestic market as a result of having been allocated export tranches by government (which both provided them with the resources and productive capacity to supply the domestic market, and placed certain obligations on them for domestic supply). As a result, the TCOA's ability to enforce the rationalisation process, largely based on their control of the market, waned, as independent producers made their own marketing arrangements. At the same time, the state had been unable fully to implement the rationalisation process, both in terms of control and in the face of significant legal challenges by excluded players. In addition, merchants with exclusive sales mandates were not all fulfilling their stockpiling and marketing functions.

The cartels and the state responded differently. The TCOA's response was to introduce the "Approved Coal Distributors' Scheme" (ACDS) which involved the compliance of merchants with certain obligations (stockpiling, quality assurance, capacity to supply all consumers in a particular area), as well as a commitment only to buy coal from TCOA wholesalers, ostensibly to guarantee that ACDS certification would not be compromised by selling coal of unknown quality, but the effect was obviously to protect TCOA's market against independents (Competition Board 1983:16-17). The state was not in a position to back this initiative on

account of the presence of independents (since the dominant role of the TCOA could no longer be justified by the state); in addition, the Competition Board was concurrently holding hearings into anti-competitive practices in the coal industry. The state's response was to issue new regulations in 1983 requiring all sellers of coal to be licensed by the DMEA, in an attempt to prevent players operating outside the rationalisation scheme. These regulations were to fulfil the function of the now-weakened TCOA cartel.

In the early 1980s, another serious setback was the newly-established Competition Board's investigation into the domestic coal and anthracite markets, which formed part of a significant ideological shift in the state's attitude to regulation and market forces, marked by the accession to power of P W Botha. The Board's conclusion on the Anthracite market was that it was anti-competitive, both on account of the activities of the APA and price control on coke and anthracite, which were removed by the DMEA on receiving the report. The APA did not wait for the outcome of the report of the investigation, but dissolved in 1982 (Financial Mail 23/4/1982). Another investigation by the Board into the coal industry was slightly more equivocal on whether the existence of the TCOA was anti-competitive; however it concluded that the ACDS was definitely anti-competitive if it included the stipulation that merchants should source all their coal from the TCOA. Other anti-competitive practices included the shareholding of the TCOA in the wholesalers, the government's new licensing system for coal merchants, including the demarcation of exclusive territories, the agreement between government, the TCOA and the NAC that only the NAC would market coal in Natal, and the whole system of price control (Competition Board 1983:34). Not surprisingly, it concluded that

> "..the free market system does not exist in the supply and distribution of coal in South Africa" (Competition Board 1983:35),

concluding that restrictive practices by the industry were partly responsible, but that the state itself was the main culprit:

> "..the rationalisation scheme administered by Government, has been mainly responsible for the severe infringement on the rights of market parties to take market-related decisions. This has led to the Department[48] becoming involved in the demarcation of sales areas, in the protection of existing merchants against new entrants into coal distribution and even to their interfering in such matters as tendering and the internal affairs of companies. Finally the Department reached a stage where it became necessary to give itself statutory power to deal with problems that could no longer be solved by negotiation and agreement" (Competition Board 1983:35).

[48] At the time, the Department of Mineral and Energy Affairs

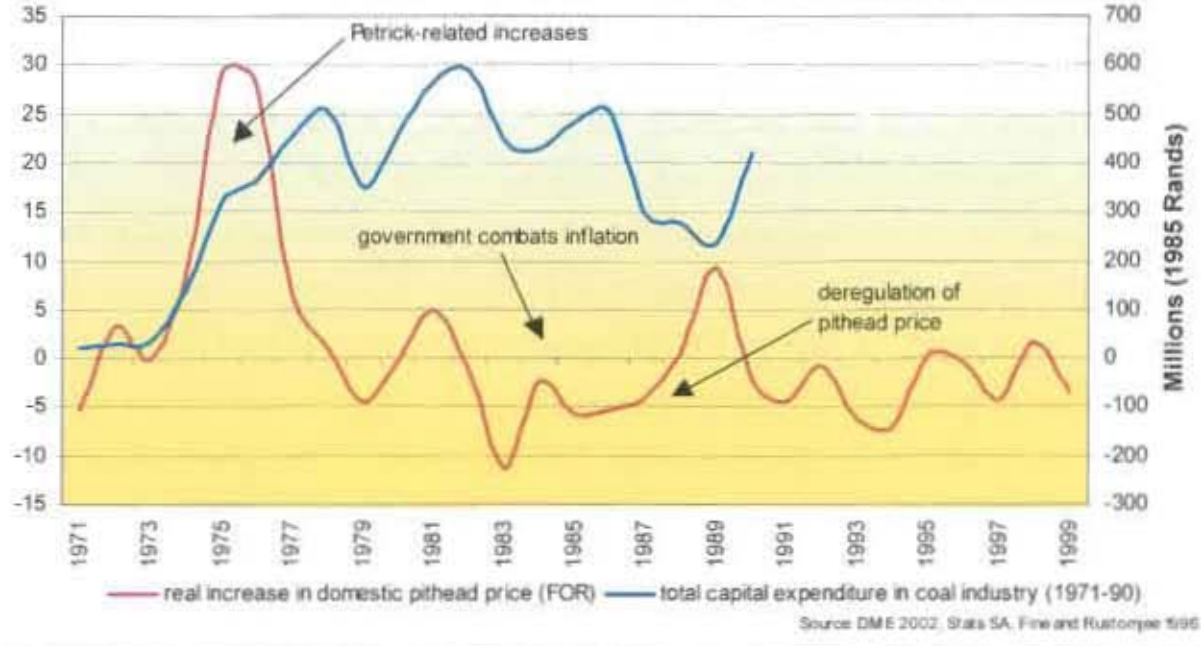
The Board recommended that the coal market be deregulated, which included the removal of price control and the removal of other controls on distribution and trading (Competition Board 1983:36). The DMEA accepted the Board's report, but attempted to address the Board's concerns through an even more complex regulatory system, and gave the Minister extensive powers to regulate the industry through the Coal Resources Act of 1985.

The Act began life as the Control of Coal Bill, which hinted at its ostensive function. Pressure from stakeholders, pending court cases against the DMEA by coal traders, ideological pressure from other quarters of the state, and finally pressure from the new Coal Advisory Board, (established in terms of the Coal Resources Act) which the Minister was obliged to consult before making decisions on regulatory issues, forced the DMEA to abandon all regulatory measures in the coal industry, including price regulation (retail and wholesale price regulations were scrapped in 1986; pithead/producer price regulation was scrapped in 1987). The last element of the regulatory system, the controls on coal exports, was removed in 1991.

The TCOA did not last much longer than regulation, and ceased its domestic marketing functions in 1988, remaining only as a vehicle for export contracts, leaving mining houses to organise their own marketing domestically (Financial Mail 8/7/1988). The underlying economic reality was that the percentage of total production which was marketed through the TCOA had shrunk drastically from a dominant market position in the mid-20th century (the TCOA, the NAC and the Natal Coal Owners' Association together marketed 64% of the coal produced in South Africa; the overwhelming share of this was a) on the domestic market, and b) through the TCOA (1946-47 Coal Commission 107)). In 1986, of a total of 173 million tons mined, 122 million tons were sold on the domestic market; only 23 million tons were sold outside long-term contracts with Iscor, Escom or Sasol, and of this tonnage, 17 million tons were sold through the TCOA (Financial Mail 2/5/1986, DME 1995). This dominant share of the domestic market was being eroded not only by independent mines, but by independent wholesalers and merchants who could work outside the cartels. More importantly, the structure of the industry had changed with a wave of consolidations in the 1970s leading to new corporate structures such as Amcoal, which were individually far more significant than the TCOA. Even the TCOA's remaining role, that of exporter, changed from being the sole agent of Transvaal coal exports in the early 1970s, to being a minor player by the time the Phase 4 export quotas were announced in the early 1980s, with its individual member corporations and other independent producers dominating the trade; export revenue had by that time exceeded domestic revenue for coal producers.

The scrapping of the regulatory system was partly due to a lack of consensus between the coal industry and the state on a new regulatory formula for setting the pithead price in the 1980s. From the 1950s until the early 1970s, the pithead price was regulated through an ad-hoc

Figure 3.6: % Real Increase in Domestic Pithead Price, and Coal Capital Expenditure



procedure, whereby the producers applied for increases, which were granted on an ad-hoc basis. As indicated above, the pithead price was generally regarded as too low to encourage new investment. In the light of the Petrick Commission, a number of large real increases were granted to producers in the early 1970s. This was both to address the problem of extraction rates, and to forestall real supply shortages, as new investment was required in the early 1970s to keep pace with domestic demand. A new pricing formula was negotiated during 1974 and 1975 (Department of Mineral and Energy Affairs Annual Report 1980:75), which allowed a margin for new investment, increased production and better extraction rates, as well as a new procedure for reviewing prices annually. Real supply shortages in 1975, coupled with the threat of an oil embargo, alarmed government into acquiescing to significant real increases (see Figure 3.6 above).

The Minister of Economic Affairs[49] commented in an interview in 1979 that in 1975,

> "..we raised prices on condition that the mining companies should make large investments in additional capacity, and these investments were made. Now we have enough to supply the domestic market, and to provide a surplus for export" (quoted in Financial Mail 29/6/1979);

thus the price increase was based on a specific contract to invest significantly in new capacity, which was also linked in turn to export contracts. Increased domestic demand, the export programme, and real increases in domestic prices from 1973-78 led to a sustained flow of new investment in the industry. However, from 1982 to 1986, the DMEA granted lower increases than stipulated in the 1975 agreement, in order to counteract inflation (Department of Mineral

[49] The Minister of Economic Affairs was the political head of the Departments of Commerce and Industry; at the time, Chris Heunis, who was also responsible for negotiating with the oil multinationals concerning future oil supplies to South Africa in the light of the oil embargo.

and Energy Affairs Annual Report 1986:68); the Department admitted that increases in the 1980s had not kept pace with rising costs. Various other pricing options were pursued by the DMEA, including investigating the possibility of lowering domestic coal prices by placing a levy on export coal (Department of Mineral and Energy Affairs Annual Report 1981:63), and price differentiation between different grades of coal, to encourage utilisation of underused coal grades; however, a committee which was set up consisting of industry and government representatives to draft a new price formula could not reach consensus. A new Coal Advisory Committee was appointed in terms of the Coal Resources Act in 1985, which the Minister was obliged to consult concerning coal regulation. The CAC, dominated by industry, took a strong line against regulation, as did the Competition Board, and regulation of the pithead price of coal was removed in 1987, which led to a short-term increase in the domestic price, before a decline in the real price set in as a result of stagnation in the export market.

Export Policy

Whereas coal policy from the 1950s to the 1960s was implacably opposed to coal exports, and discouraged them through a number of measures, a significant *volte-face* took place in the 1970s. The Petrick Commission opposed a large-scale export programme as being counter to a conservation-orientated coal policy (1970-75 Coal Commission:191-192). This concern, however, was ignored and overridden by government, which began to see the export problem in a new light. There were two aspects to this abrupt change. The first was a strategic shift in industrial strategy in general, and particularly strategies for developing the export and beneficiation of base minerals, and the second was a complex policy stance developed as a response to a range of coal-related problems in the 1970s, particularly those raised by the Petrick Commission and the problem of domestic supply.

The crux of the export programme was the Richards' Bay Coal Terminal, and equally important, the rail link between the eastern Transvaal (site of the major coalfields and other mineral producers), and the port at Richards' Bay. Without this co-ordinated transport and shipment arrangement, and a dedicated rail network for export, the coal industry would not have been able to overcome the traditional transport bottlenecks. In addition, a dedicated deep-water coal terminal and rail link would facilitate the swift handling of huge tonnages of coal, which could not be handled by existing infrastructure.

Richards' Bay was identified as a site for a deep-water port in 1966 in a joint strategic initiative involving the South African Railways and Harbours, the IDC and private capital. Work began in the following years on a range of beneficiation projects in Richards Bay, including a giant aluminium smelter and a titanium smelter, which formed part of the IDC's beneficiation and

import-substitution strategy. This type of strategic thinking in government was based in a web of institutions in the IDC, the Department of Planning (established in 1964), and ultimately the Minerals Bureau (1975); the first two organisations were well-integrated with the Cabinet via the Economic Advisory Committee. This shift was supported by the corporate restructuring of private minerals interests in the late 1960s and throughout the 1970s which led, often with assistance from the IDC, to a number of export-oriented beneficiation industries (Fine & Rustomjee 1996:172). The network of which the IDC formed a core, and in which its Chairman (until his death in the early 1970s) played a key role, constituted what will be referred to as the 'industrial policy elite', and dominated much of South Africa's industrialisation planning in the latter half of the 20th century.

The resources required to launch a significant export industry required extensive co-operation between key industry actors, as well as between them and the state. Negotiations with Japanese companies beginning in 1969 led the TCOA to open negotiations with government on two fronts. The first was to get approval in principle for coal exports totalling 12 million tons annually for 30 years in 1969 (Lang 1995:159), and the second was to deal with the logistical problems involved in moving this coal to the coast and onto modern bulk coal carriers, which was resolved in a landmark public-private partnership in which the TCOA would construct the coal terminal, help finance the rail link, and guarantee adequate loads, which it was in a position to do on account of a pioneering contract concluded with Japanese steelmakers to provide blended coking coal. As Fine and Rustomjee observe,

> "..the coal export industry could not have developed without closely co-ordinated policies which facilitated the pooling of large-scale resources.. ..the development of coal export policies resulted in enormous state and private-sector capital investments" (Fine & Rustomjee 1996:169).

The coal terminal and rail link opened for operation in 1976. To mark the occasion, the TCOA chartered the country's luxury Blue Train to transport coal executives and others to the terminal, at which they met the Prime Minister, who alighted from a Navy vessel to officially open the terminal (Lang 1995:160), signifying commitment by both the state and the private sector at the highest level to the project, which was seen as a flagship for a new era of minerals-based infrastructure development and industrialisation.

With the infrastructure in place, the question of coal export policy needed to be resolved. In the wake of the Commission's negative remarks, the coal industry attempted to counter what appeared to be a common-sense-based approach to resource conservation by arguing that a) while there was an international renaissance of coal demand, a massive export programme should take advantage of it, b) the foreign exchange earnings would be considerable, and do a lot

to offset balance of trade problems due to increased oil import bills (Financial Mail 27/2/1976), and c) that local demand consisted of, and would consist of (except for metallurgical coal) mainly low-grade coal, which it was not economic to export. In the meanwhile, the state had transferred the control of coal exports from the 1942 War Measure in terms of which they had originally been controlled, to the more formal Import and Export Control Act via a regulation (R2432/2433, Government Gazette 4013 14 December 1973), removed export control from the ambit of the Fuel Research and Coal Act (amendment 27/1973). The actual motivation for this, which in fact did not change the technical powers of the state to prohibit coal exports, was strategic; in the same Government Gazette (R2434/2435), the Minister of Economic Affairs also shifted similar controls on the export of petroleum products from War Measures to the Import and Export Control Act. Both measures were taken in the light of the 1973 oil crisis, which meant that there was a confluence in strategic thinking between coal and oil policy.

A further problem, created by both oil crises, was the trade balance, which the cost of crude oil was putting under pressure, particularly by the end of the 1970s. Persistent balance-of-payment problems were noted by in 1976-1981 Economic Development Programme[50], "..partly as a result of the adverse changes in the terms of trade which arose, *inter alia*, from the rise in the oil price relative to other prices" (South Africa 1976:28). The Programme went on to note that

> "..finally, as regards foreign trade policy.. ..it will only be possible to keep the deficit on the current account of the balance of payments within reasonable limits if imports grow at a lower rate and exports (excluding gold) at a higher rate than in the recent past. Special attention will therefore have to be given to suitable measures to give further encouragement to import substitution and to promote exports" (South Africa 1976:29).

Non-gold mining, and the Richards Bay coal export project, were singled out as promising areas of development in this regard (South Africa 1976:21). The 1978 Plan was more explicit; in drawing up different growth scenarios, the highest growth scenario was based on

> ".. a further intensification of South Africa's export drive, which was also the only way in which economic growth could be enhanced .." (South Africa 1979a:33).

Coal was optimistically singled out in this regard (South Africa 1979b:35-38), and the growth rate of the coal volume output was expected to double in the planning period (1978-87). The state's newly-created strategic minerals policy unit, the Minerals Bureau, had as one of its main aims not only the encouragement of exports, but also their direct promotion through an international network of officials in key foreign capitals of both potential markets and competitors – the Bureau not only advised regulators on the coal export programme, but *facilitated* applications from industry as well:

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[50] Economic Development Programmes were drafted and published by the Department of Planning in the 1960s and 1970s, under the auspices of the Economic Advisor to the Prime Minister, based in the Prime Minister's Office.

> "..miscellaneous activities include *inter alia* advice to the Department of Commerce and mining companies on applications for the export of coal; general coal export promotion activities.." (Department of Mines Annual Report 1976:59),

as well as periodically evaluating the competitiveness of South African coal exports, and attending international coal conferences.

At the same time, the state had two further goals. The first was to address the problems raised by the Petrick Commission concerning extraction rates and efficient resources use generally, and the second was to address the problem of supply for the domestic market. With domestic demand expanding rapidly, especially for electricity generation[51] (Escom was in the middle of a massive expansion programme – see Chapter 4), and possibly for further liquid fuels programmes, the broader considerations of the Commission, concerning end-use energy conservation and an end to cheap energy, were sidelined.

While the Commission espoused the traditional view of coal exports, the state's policy solution comprised a paradigm shift: the solution arrived at was to launch a massively-expanded coal export programme, which would meet a number of policy goals in one programme, as well as having the enthusiastic backing of the coal industry. Export permits would be issued to parties that were able to meet certain criteria, including supplying the domestic market and improving extraction rates, which, given the revenue resulting from exports, would provide the state with the necessary leverage to achieve its policy goals, including enhanced foreign exchange earnings, without regulating the industry directly. The first Director General of the DMEA stated that

> "..it is well known that coal exports lead to enhanced earnings which in turn makes it possible to improve the extraction of available coal reserves.." (quoted in Financial Mail 5/3/1982).

The high potential value of exports would allow coal companies to achieve high production and extraction rates while providing cheap (regulated) coal for the domestic market, which was still a central principle of South Africa energy policy. There was an additional policy goal which could be met through export tranches: multinational oil companies had taken an acute interest in coal since the oil crisis had brought about its renaissance, and had begun to invest in the international coal market, which provided additional leverage for the state to secure its oil supplies in the face of a worsening international situation which became acute after the fall of the Shah, as well as

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[51] During the 1970s, Sasol was also constructing a new massive synthetic fuels plant, and yet another was constructed at the end of the 1970s; however, both these plants used low-grade coal from Sasol's own captive colliery. Export ceilings were calculated using demand models which assumed that "all domestic liquid fuel needs would be coal-based from the year 2000" (Dr Robert Scott, director of energy planning in the DMEA, quoted in Financial Mail 5/3/1982), which would have meant that the synthetic fuels industry would now be using around 160-180 million tons of coal per year, around 100-110% of domestic demand.

providing additional incentives to existing coal companies through the threat of allocating export permits elsewhere.

The instrument for doing this was a series of export tranches, in which applications from potential exporters were evaluated, and maximum tonnages allocated according to how well the applicants met the specified criteria, or other policy goals. The export programme was stepped up in four phases, each phase consisting of a ceiling for total exports, divided amongst a number of coal producers. The conditions for export allocations were progressively refined. The first was granted in 1974, and was dominated by the TCOA/NAC[52] and APA[53], but also included small allocations for a few oil companies. The second, allocated in 1976, included a reduced role for the marketing associations, and the third allocation, in 1979 (after the second oil crisis) comprised a significant role for the oil multinationals, an enhanced role for the individual conglomerates, and a much lesser role for the cartels. The reason for this favourable accommodation of these relative newcomers to the industry was stated by Economic Affairs Minister Chris Heunis; the export allocations were subject to "the condition that they continue to fulfil their obligations in supplying liquid petroleum fuels in the country" (quoted in Financial Mail 18/5/1979), and added that the total oil companies' export allocation would "be reviewed should any of the oil companies no longer contribute towards the country's needs for petroleum products".

The fourth phase, announced in several parts in the early 1980s, required applicants to demonstrate that they would be

> "..first, ensuring optimal extraction of reserves and, secondly, and of equal importance, ensuring adequate supplies, in quantity as well as quality, of all the kinds of coal needed for local requirements" (Department of Mineral and Energy Affairs Annual Report 1980: 64).

To these were added three more main conditions: 1) compliance with environmental standards in mining practice and rehabilitation; 2) observing international market prices for coal exports (to prevent discounting or transfer pricing to protect foreign exchange earnings), and 3) contributing to the maintenance and extension of coal export infrastructure, including rail links, coal terminal facilities etc. The head of the DMEA's Energy Branch commented in 1982 that

> "Coal export allocations are government's strongest tool for manipulating optimal reserve extraction and utilization of our coal resources" (quoted in Financial Mail 5/3/1982).

Export allocations would last for 30 years, and reach a total ceiling of 80 million tons/annum during this period; conditions could be modified, or allocations withdrawn in the face of non-compliance. The phase 4 conditions were also tied to specific mines; thus 18% of phase 4A

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[52] The TCOA and the NAC formed a joint exporting body in the early 1970s, followed by the amalgamation of their marketing activities; however the two associations split again later in the decade.

[53] Anthracite was produced in relatively small quantities in South Africa, but was mainly exported.

allocations were granted to mines where extraction needed to be 'optimised', 38% to mines in areas which were "regional development priorities", and 44% tied to mines supplying Escom. The aim of the latter allocation was to ameliorate the rise in electricity costs, shortly a subject of a Commission of Inquiry:

> "..wherever possible, the aim was to facilitate the establishment of multi-product mines, where a better quality coal which can be exported at higher prices could be creamed off and thereby contribute to lower overall costs for electricity generation" (Department of Mineral and Energy Affairs Annual Report 1982:65)[54].

In reality, potential exporters were also limited by another factor, which was the ownership of export facilities. Small players effectively did not have access to Richards' Bay without the co-operation of the major players; although coal was exported in small quantities through Maputo and Durban, this effectively restricted access to the market to major industry players.

Coal export policy stayed roughly within this framework until 1991, when exports were deregulated. Exports grew throughout most of this period, until they began to stagnate in the late 1980s due to international sanctions against South African coal, which received widespread support partly on account of a world glut at this time, as well as a drop in the oil price. In 1991, the Coal Advisory Committee concluded that policy goals of export control had been achieved, and that there was no longer any necessity to control exports; the Minister removed all controls on exports in March 1991 (National Energy Council Annual Report 1990/1991:38), which ended not only export control, but state involvement in a whole range of other aspects of the coal industry.

4) late 1980s to 2004

There are three developments which mark the beginning of this phase. The first is the drafting and adoption of an Energy Policy White Paper from 1985 to 1986; the second is the phased deregulation of the coal industry, from 1986 to 1991, and the third is the creation and subsequent demise of the National Energy Council (see Chapter 7 for a more detailed discussion of the formation and demise of the NEC), followed by the transition process and the election of the first post-apartheid government. The period as a whole is characterised by a withdrawal by the state

[54] Fine and Rustomjee observe that this tie-in between Escom contracts and exports was a more long-term and pervasive influence on the structure of the industry. Aside from this obvious economic connection, Escom contracts, which expanded dramatically in the 1970s, were used to a) encourage Afrikaner capital in the coal industry ("..through the patronage of Escom contracts, Genmin's TNC had become the largest single producer of coal in South Africa by the early 1970s.."), and b) focus and restructure the fragmented coal industry of the early 1970s into a centralised, high-volume, export-oriented industry, which earned precious foreign exchange while keeping domestic energy prices as low as possible; "..subsequent Escom contracts were integrated within broader policies for the development of the then fragmented coal industry as a whole.." (Fine and Rustomjee 1996:169)

from effective involvement of any kind in the coal industry; the post-apartheid era is notable for a conspicuous lack of interest, from an energy policy point of view, in the industry.

The drafting of the Draft White Paper (1985) and the White Paper (1986) were officially overseen by the Energy Policy Committee; the White Paper itself is remarkably brief and contained almost no explicit mentions of coal, other than general commitment to 'market forces', 'optimal use of resources' and so forth. The Draft, however, contained as an addendum a number of energy 'plans' for different areas of policy, including coal, which contained, under a heading titled 'strategy', a range of ambitious goals and ongoing activities, including the continuous evaluation of South African coal reserves in terms of their geology, economics and applications, the "encouragement of the optimum recovery of mineable reserves" and the linking of mining development to other strategic and regional developmental goals, promoting the use of discard coal, researching more efficient coal conversion technologies, promoting optimum extraction rates, and ensuring security of supply for the inland market (including ensuring stockpiling, a national contingency plan and a pricing strategy which would guarantee adequate production capacity), while phasing out government involvement in coal markets (1985 Draft Energy Policy White Paper:12). This would be underpinned by a "policy-based national coal research and development programme".

In practice, state involvement in the inland market was terminated on the advice of the Coal Advisory Committee in 1986 and 1987, and all major decisions regarding the export programme had been made in the early 1980s, except for the decision to deregulate exports in 1991. The remaining activity of the state in relation to coal between 1986 and 1991 (aside from being an important consumer through Escom) was research. State energy research functions had been increasingly centralised; in 1983, the FRI was merged into the CSIR's National Programme on Energy Research (NPER), and with the formation of the NEC, the NPER was brought under the NEC. A large-scale coal research programme was undertaken, covering mining and utilization, with a particular emphasis on discard coal which, a by-product of beneficiation (the largest tonnages begin produced by the export programme) was produced (and still is) in massive quantities. Current estimates from the DME's National Inventory of Discard and Duff Coal indicate that annual production of discard coal was estimated in 2001 to be 66.2 million tons, up from 43.6 million tons in 1985. According to the national inventory, a total of 1121 tons of discard coal is available in dumps adjacent to coal mines (Department of Minerals and Energy 2001a:2-4)[55], representing a significant fraction of total annual production. Expenditure on coal

[55] Discard coal is produced as a by-product of coal beneficiation, and consists of coal which does not conform to production specifications for specific uses, especially for export. It thus has quite a variable range of calorific values and ash and sulphur content; in addition to representing a wasted resource, it also poses an environmental hazard, from leaching and from combustion. Much of this coal has potential uses (e.g. power plants), but economic and logistical factors need to be overcome.

research involved the majority of research expenditure during the NEC's existence (63% in 1988/9 and 56% in 1990/1) (National Energy Council Annual Report 1991:7), but the programme was "extensively revised" in 1990 after "extensive consultation" with the "coal community" (National Energy Council Annual Report 1991:30), and scaled back significantly after the demise of the NEC. Planned demonstration projects, especially relating to coal discards, were cancelled (interview with J Basson), and the programme was effectively eliminated in 1993, when the Cabinet apparently decided that research would be limited to policy issues (Department of Mineral and Energy Affairs Annual Report 1993:57). The intellectual property was taken over by a CEF subsidiary, which, after unsuccessful attempts at commercialisation, was closed down in 2002.

The CAC, the stakeholder advisory body, was abolished with the formal abolition of export controls in 1992 (with the repeal of the Coal Resources Act). State activity in relation to the coal sector was now limited to collecting and processing data on coal reserves and production, largely performed by the Minerals Bureau, and a few minor investigations into discard coal, low-smoke coal (for residential use), and more environmentally-benign coal technologies. This shift away from what had been, with petroleum imports, at the centre of the state's strategic energy policy thinking in the 1970s, was confirmed by a notable lack of interest during the energy policy processes which characterised the transition, and in the formulation of the new White Paper from 1995 to 1998.

The ANC's 'Draft Minerals and Energy Policy Discussion Document' (ANC 1994a), deals with coal specifically only in reference to low-smoke coal, as does the RDP Base Document (ANC 1994b). The 1995 Energy Policy Discussion Document formed the parameters for the White Paper process. The Document is revealing in that it is a synthesis of policy options, representing a combination of old-guard DMEA policy positions, and alternatives and others regarded as important by the new government[56]; as such it is a lengthy document. Of 75 pages dedicated to the energy supply sectors, the coal section, which begins with the observation that "..three-quarters of South Africa's primary energy is sourced from coal.." (1995 Energy Policy Discussion Document:146), only takes up 2¼ of these. The policy options are a scaled-down version of the coal policies of the 1986 White Paper; what remains are only three points: maintaining a coal reserves database, finding solutions to the discard coal problem, and investigating efficient coal use technologies. There is an additional proposal to tax coal, to encourage investment in energy-efficient end-use technology and diversify the energy supply base (1995 Energy Policy Discussion Document:146-148). The final White Paper, which

[56] This co-existence was brought about a) by the persistence of the old energy bureaucracy post-1994, and b) the appointment of a Nationalist Minister of Minerals and Energy, as part of the National Party's allocation of Cabinet posts under the Government of National Unity, which perpetuated both old-guard leadership within the energy bureaucracy, as well as old-guard policy ideas.

appeared in December 1998, opted for continued deregulation, maintaining a coal resource database, promoting low-smoke coal for households and the use of discard coals, promoting end-use efficiency and clean-coal technologies, and investigating the use of coal-bed methane (1998 Energy Policy White Paper:87-90), although in reality, aside from the resource database and other mining-related functions pursued by the mining bureaucracies, the maintenance of a coal discard inventory, and the recent release of a low-smoke fuels strategy document, there has been no state coal-related activity since the 1998 White Paper.

Conclusion

In conclusion, there were three phases of policy development: from the 1920s to the 1940s; from the late 1940s to the 1960s, and from the 1970s to the 1980s. During the first phase, basic institutions were put in place, and the policy framework for the second phase was derived. A policy network developed, consisting largely of the coal industry, organised through industry associations (primarily the TCOA), government departments, and the FRI. Government involvement in the industry was initially conducted through the Department of Mines and Industry, in a mining policy context, both in terms of coal production, and as an important direct or indirect input to the mining industry. With the creation of a dedicated Department of Commerce and Industry in 1933, a rival policy context developed (industrial development) and the role of the Department of Mines was superseded by the Department of Commerce and Industry. There was a crucial choice at the end of the 1930s, laid out by the 1939 Base Minerals Committee as a choice between a resource-based approach to developing the coal industry, and an industry-based approach, centred on the institutional location of the FRI; in other words, to concentrate state resources on assessing and developing the coal resource, or on developing applications for coal in the developing industrial economy. The latter view prevailed, and coal policy was placed in an industrial policy context, and the state's mining bureaucracy was marginalised. The key policy issues during this period were related to problems in developing the coal market: developing quality standards for the export trade to promote South Africa's competitiveness as a coal supplier, and guaranteeing supplies to the inland market. The role of the state, which it undertook co-operatively with the coal industry associations, was to develop institutions to enforce grading standards (placed in the FRI), and to mediate the interests of domestic consumers: the railways, electricity producers and other consumers. At the beginning of this period, coal companies were owned by a number of interests, and attempts to form cartels were only partially successful: however, by the 1930s, coal interests had been consolidated, and became dominated by the gold industry. The role of the TCOA became central in liaising with the state on policy issues. The first strand of a resource-based approach to coal policy emerged in

the 1930s, with the establishment of Iscor, the state-owned iron and steel works, which raised the potential problem of a supply of metallurgical coal, However, in the 1930s, the state did not possess the institutions to investigate whether this posed a problem or not.

The second phase of coal policy development, from the 1940s to the 1960s, was inaugurated by two significant events. The first was the introduction of price control as a war measure, and the second was the Coal Commission, which developed a consolidated regulatory system restricting coal exports and regulating the domestic coal price. Policymaking and regulatory authority shifted almost entirely to the Department of Commerce and Industry, and the Department of Mines had little or no influence during this phase. At the beginning of the 1950s, there was a strong consensus between government and the coal industry, and the latter played a key role in the Commission's report. In addition, the state pursued other policy goals, notably the promotion of Afrikaner mining capital through the coal industry, and new Afrikaner-owned coal companies were admitted to the TCOA, and used their coal interests to conclude their most significant acquisition in the 1960s: a large stake in the gold industry. The coal price was maintained at a very low level to encourage industrial development though cheap energy inputs, which was a policy goal endorsed by the owners of the coal industry, which had played a dominant role in the 1946-47 Coal Commission. However, during the 1960s, this consensus was undermined by rising costs, which the regulatory system did not take into account, as well as a requirement for new investment, and the coal industry began calling for an end to price regulation, heralding an end to the tightly-structured policy community which had developed the 1950s policy framework. In addition, the coal industry's interests were increasingly independent of the gold industry's interests, since the industrialisation of the 1950s and 1960s had resulted in the gold industry consuming a significantly smaller proportion of the country's electricity.

The third phase of policy development, from 1970 to 1991, began with a minor policy crisis in the form of a report from a committee operating under the auspices of the Coal Advisory Board, which suggested a new challenge for coal policy by arguing that coal resources as a whole would be exhausted in the medium term. The genesis of the report was very interesting; it was effectively undertaken by a new state agency, the Department of Planning, which seconded several staff to undertake it, who in a novel development had been tasked to assist the Planning Advisory Council in assessing the country's future energy requirements. Moreover, the institutional site which was chosen by the Department of Planning's leadership to undertake this work was also significant: the Coal Advisory Board's main function was to advise the Minister of Mines on the metallurgical coal resource, which was the only resource-based aspect of 1950s and 1960s coal policy, and an ideal point to raise the question of general coal resources.

The effect of the report was highly significant: it led directly to the appointment of a Commission of Inquiry into the extent of coal resources, which reached substantially the same conclusions, and also coincided with the 1973 oil crisis; the coexistence of the inquiry and the oil crisis led to a full-blown policy crisis which in turn brought about significant policy change and institutional reform. The reason that this potential planning problem became a policy crisis was a combination of three factors. First, it suggested that the country was facing a looming 'energy crisis', probably in around 1990, which would necessitate the identification of another energy source: this perspective was eagerly supported by the nuclear establishment (and by the Minister of Mines in particular – see Chapter 5), who saw nuclear power as a replacement for coal as the country's primary energy commodity. More importantly, it raised the question of energy per se as a vital policy question, which had not been done before. Second, the strategic context was highly significant, and led to concentrated attention from the country's political leadership: at the time, the country was facing the threat of an oil embargo, and taking measures to counteract the threat. Previously, this had been seen as a limited threat (oil only), but the CAB report and the Commission highlighted the strategic problems the country would face if it could not depend on coal. This was connected to the third (and in many ways decisive) factor, which was the possibility of countering the embargo threat through the establishment of a large-scale synthetic fuels industry based on coal, which would provide a considerable proportion of the country's liquid fuels. While the existing synthetic fuels industry (Sasol, which also administered the state's existing oil security strategy projects) was at the time a minor coal consumer, it was a keen advocate of a change in coal policy paradigm (from one based on the lowest price to a resource-based policy involving a considerable price increase[57]). Shortly afterwards, the oil crisis created conditions where for strategic (a real threat) and economic (oil price increases made an expanded synthetic fuels industry economically feasible) reasons, a large synthetic fuels industry was a real possibility. This connected the domains of liquid fuels policy and coal policy into a more complex energy policy domain.

The policy outcomes, however, while stimulated by the Petrick Commission, ignored its recommendations in one vital respect: whereas the Commission urged caution in allowing coal exports, the state instead embarked on an aggressive scheme to promote exports. The new coal policy framework (outlined in detail above) which emerged was the outcome of a new policy consensus between various state agencies and the coal industry, around which a new policy community was established. The coal industry had pioneered a new export industry through their

[57] It is interesting that the leadership of what became of the biggest coal consumers in the country should have been advocating a coal price increase. Sasol produced its own coal for all its plants, and was thus not affected by regulated prices; however, it is interesting to note the national role that Sasol's leadership played when making such announcements, since they were very close to the centre of the state's oil security strategy.

contract with the Japanese in the late 1960s, due to come to fruition in the mid-1970s. Initially, this was brokered by the TCOA, but reorganisation of the coal industry into corporate groups, and the granting of export permits to non-TCOA entities, as well as the decline in importance of the domestic market, led to a decline in influence of the TCOA, and its ultimate demise in the 1980s. Instead, the main industry actors from the 1970s in the policy community were the major coal groups.

The focus of their interest in coal policy was the export trade, and higher domestic prices, which were necessary in order to fund the investment required for new capacity and infrastructure for both the domestic and export trades. State agencies involved in coal policy had begun to change significantly as the policy consensus broke down. Whereas in the 1950s and 1960s, coal policy had been dominated by only one state agency, the regulators in the Department of Commerce, by the time of the Petrick Report several other agencies had eclipsed that Department. This was most clearly demonstrated by the subcommittee assembled by the EPC to consider the Petrick Report, which consisted of representatives from Sasol, Escom, Iscor, the Office of the Government Mining Engineer, the Geological Survey and the Minerals Bureau (the last three located in the Department of Mines), but notably without a representative from the Department of Commerce. As the Chamber of Mines pointed out, the Department of Commerce did not have any capacity to evaluate coal policy questions in terms of the new framework (resources and extraction rates), and thus could not continue to make decisions about domestic price-setting based on criteria they were familiar with (for instance, combating inflation). Instead, there were three important groups within the state which determined the new policy. First, there was the IDC, which had already begun to develop the Richards Bay project with the coal industry and other state agencies, and also many companion projects (including the Alusaf smelter); second, there were the new resource policy institutions, including the Minerals Bureau and the energy section in the Department of Planning; and third, there were economic policy agencies eager to address looming trade balance problems. These agencies were co-ordinated through the EPC and the PAC (of which the IDC was a member), and via these with the state's economic planning co-ordinating processes in the Office of the Prime Minister. The EPC played a central role in approving export permits. The development of a large export programme, coupled with a massive investment programme in new mines, formed the core of the new consensus between these actors. Outside of this, the coal industry was prepared to trade off various additional state goals for increased export quotas and higher domestic prices.

These developments led to considerable institutional innovations. Coal regulatory functions, in the Department of Commerce and presided over by the Price Controller, were demoted, and several new agencies were developed. The Department of Planning played an increasingly

central role, through natural resources planning, through newly-created energy planning functions, and through its economic planning functions (via the Economic Development Programmes). The Department of Mines achieved new influence due to the importance of resources and extraction techniques, but primarily through the Minerals Bureau, a new agency which developed a capacity to evaluate coal resources on an ongoing basis, institutionalising and extending the processes developed in the Petrick Commission. In 1980, a new integrated state agency, the Department of Mineral and Energy Affairs, was created, with coal policy as the primary justification for the location of the enhanced energy policy function.

There was a high level of interaction and co-ordination between these state agencies and the coal industry to bring about the transformation in the coal sector which occurred in the 1970s. The Richards Bay project involved such co-ordination, as did the massive investment programme in the 1970s in new mines to supply Escom's new power plants. In addition to this, other structures such as the Coal Allocation Committee were developed in the 1970s to address bottlenecks in the domestic market.

The final chapter of this transformation occurred in the 1980s and early 1990s, which began with the deregulation of the domestic market. By the mid-1980s, several factors had changed to undermine the consensus on domestic regulation in the 1970s. The first was the pricing regime, which was once again being used by the state to control inflation by granting below-inflation increases. As a result, relatively high pithead prices in the 1970s were eroded by inflation in the 1980s, and a new basis for price-setting could not be agreed on between industry and the DMEA, and industry renewed its calls (last made in the early 1970s) for deregulation. The second was an ideological shift in both the state and the private sector towards deregulation and privatisation, which resulted in the establishment of a more powerful competition authority in the early 1980s, which produced a highly-critical report on the domestic coal market. The third was the waning influence of the TCOA, which lost its dominant position in the coal industry from the late 1970s. The TCOA was an essential part of the regulatory system, and the TCOA and the regulatory section of the DMEA (which had been transferred from the Department of Commerce) were by the mid-1980s the only advocates of regulation. The CAC, which made the final decision, placed domestic coal pricing policy into a broader context, since it contained a range of representatives, including independent producers and consumers. With the disappearance of the strategic imperative in 1990, the last form of regulation was removed with the lifting of export controls in 1919. Although coal-based research formed a significant part of the NEC's research programme in the late 1980s and early 1990s, coal policy activity was minimal from 1991 onwards, and was limited to periodic assessment of reserves, and periodic deliberation on projects such as coal discard use and low-smoke coal (which have not been implemented). Formal stakeholder

participation in coal policy was terminated with the abolishing of the Coal Advisory Committee after export restrictions were lifted. It is notable that the NEC could not reach consensus on its extensive list of proposed coal projects (see Chapter 7); the government lost interest with the decline in the security imperative, and the coal industry was not interested in projects which would have resulted in a fall in coal demand, since energy consumption growth rates had slowed considerably by the late 1980s.

The lack of interest or activity around coal policy in the 1990s, and particularly during the transition, is notable, given the central place it occupied in 1970s energy policy. There are several reasons for this: the first was that the 1970s problems had been addressed through massive investment, improved extraction rates, improved domestic coal distribution infrastructure, and improved coal utilisation (reserves had doubled by1990); the second was that once the state had lost its leverage in the form of regulation (particularly export regulation), its 'infrastructural power' in the coal industry declined, as well as its institutional infrastructure (developing coal policy outside a regulatory environment required different institutional resources); the third was that there was a general decline in interest in strategic resource use (with the end of apartheid), and a shift in energy policy from the coal-oil nexus (resource-based) to an electricity-liquid fuels nexus (market-based). The fourth reason was that the 1970s represented the high point of an investment cycle, which, given the absence of new power plants, has not recurred. A final and more interesting reason was that it was not defined as a problem because of the way in which problem-definition operated during the transition: this revolved around two central aspects: control of the state and state institutions, and extending the scope of energy policy to encompass the interests of black South Africans. Since coal was by then deregulated, and was a privately-owned industry, there was no state apparatus to gain control of (as there was in the oil industry); furthermore, the coal industry was almost entirely a primary industry, which sold most of its produce to other producers (Eskom, Sasol or exports). Thus, the old problems had been addressed, and there were no new ones to trigger the kind of interest shown in other energy sector industries.

We are now in a position to place the development of coal policy in the energy policy paradigms framework developed in Chapter 2. The key point in this respect in coal policy development is 1970. Before this, the characteristics of coal policy resembled closely the properties of paradigm 0. Coal policy activity was not integrated with other energy sector policy activities: coal was regarded as a basic input into the economy, and priced as low as possible in a policy consensus (until the mid-1960s) between government and the coal industry, as a basis for industrial development. Unlike in other industrialised countries, there were limited coal supply

bottlenecks[1] in South Africa in the post-war period, and for various reasons coal was generally not replaced by liquid fuels in the economy in 1950s and 1960s. Paradigm 1 energy policy institutions were thus not developed in this period; neither the 'information frontier' nor the 'institutional frontier' were developed to the point where energy policy questions could be addressed or policy alternatives formulated.

However, with the CAB report, the Petrick Commission report, and the 1973 oil crisis, coal policy was placed in a new policy context, which was accompanied by significant institutional change and development. The new coal policy paradigm formed a basis for the development of an energy bureaucracy, a minerals policy agency, and a nexus between minerals policy, energy policy, and various components of the energy sector, including electricity and synthetic fuels. Coal policy activity was fully-integrated with the state's nascent energy policy processes – key coal policy decisions were all co-ordinated and ratified by the Energy Policy Committee. The types of policies adopted and the institutions developed all correspond with paradigm 1: primary goals of post-1970s coal policy were a) boosting production levels at an accelerated rate, and b) substituting coal for oil, which was a form of optimisation of the energy supply system in the peculiar conditions created by apartheid (the oil embargo), and c) maintaining a low domestic coal price. Decision-making was successfully shifted from a narrow focus on the domestic coal market, and placed into a broader strategic context, and was supported by a new expanded coal policy community.

Institutional capacity, which did not exist before, was created to map coal resources in sufficient detail, as well as forecast coal demand, which was a central function of both the energy bureaucracy, and the Minerals Bureau, which pushed the 'information frontier' into paradigm 1, and allowed the development of resource-based coal-energy policies. However, consensus was not reached on extending the complexity and sophistication of this paradigm in the late 1980s in the NEC (for instance, the use of discard coal), and this combined with the disappearance of the strategic imperative led ultimately to deregulation and disengagement by the state from the coal sector in the early 1990s. As a result, coal played a minor role in post-apartheid energy policy as a new energy policy paradigm emerged; concern about coal reserves was limited in the 1990s to a small group of experts.

[1] There were many coal *transport* bottlenecks, especially in the 1950s.

Chapter 4

The Development of South African Electricity Policy

"In South Africa you can never plan too big." Hendrik van der Bijl, founding Chairman of Escom (1947 – quoted in Christie 1984:150)

Overview

The electricity industry in South Africa has a number of significant characteristics. The first is the relatively important role of electricity in the economy: whereas in the average IEA country in 2002 electricity comprised 19% of final energy consumption (www.iea.org: 3/10/2005), in South Africa electricity comprised 26% (Department of Minerals and Energy 2002b). The reasons for this are related to two characteristics of the South African energy system: the first is the concentration of energy intensive industries, the economics of which are premised on cheap electricity, and the second is the distribution of income, which results in a relatively low domestic use of electricity, as well as a lower consumption of liquid fuels due to relatively low car ownership.

Electricity is at the crux of Fine and Rustomjee's 'Minerals-Energy Complex' (MEC – see Chapter 2), based primarily on coal, and providing inputs into other mining and energy-intensive industrial activities. South Africa's electricity system is based around a single technical-economic system: the generation of electricity from low-grade coal, which has been developed to match South African conditions over the last 100 years. Almost all South Africa's electricity was generated from coal-fired plant until the 1980s, when a nuclear plant was commissioned: in 2000, around 92% of sent-out electricity in South Africa was generated from coal, around 6% by nuclear power, and the rest from hydroelectricity and other sources (Eskom Annual Report 2000). Thus, unlike other parts of the world, the role of oil is and has been almost negligible in the history of the South African electricity system; current liquid fuels electricity plant in South

Africa is limited to 342MW of peaking capacity out of a total installed capacity of around 42 000MW.

The economics of electricity in South Africa were thus only indirectly influenced by world oil price fluctuations such as the 1973 oil crisis. This isolation was enhanced by the nature of the South African coal market: power station coal has generally been used at the mine mouth, and not been export quality, and therefore the price, usually determined by long-term contracts, was also only indirectly affected by international coal price fluctuations. The resulting economic independence of the South African electricity system from the world energy markets had several significant effects on institutional and policy development, which will be discussed below.

The development of the electricity system unfolded in two main phases. During the first phase, electricity systems were developed regionally, and based largely in local authorities, with the exception of a privately-owned system developed to serve the emerging gold-mining region on the Witwatersrand. During this period, a state electricity utility was created (Escom), which developed regionally-based electricity systems for supplying local authorities, industry and mining. These regional systems were gradually integrated into a national grid. The second phase began with the completion of the national grid, which established the long-term institutional and technical pattern for the electricity industry in South Africa, which had several key features. The first was a division between the production and transmission of electricity, and its distribution: the state utility Escom owned and controlled the former (and made key decisions concerning expansion), while local authorities generally controlled the latter. The second was a historical anomaly, but a key component of the system: Eskom supplied electricity directly to mining and heavy industry, even if these industries were located inside the supply areas of local authority. The third was that the development of the distribution industry, because it was controlled by local authorities, was fundamentally affected by apartheid; white households were almost entirely electrified, whereas black households were largely not. During the transition to democracy, Eskom assumed a right of supply to many 'black' areas in order to electrify them, and thus developed a significant presence in the distribution industry.

The two key policy-related characteristics which have featured prominently in the development of the electricity system are thus a) the key relationship between electricity and energy-intensive industries, in which Escom played a central role, and b) the influence of apartheid on the development of the distribution industry and its implications for energy poverty; these will form a key component of the discussion of the development of electricity policy, and its relation to broader energy policy issues and institutions, below. In order to place key policy developments in their political and economic context, a brief discussion of the development of the structure of the industry is followed below by an outline of key actors and institutions, and an overview of

the political economy of electricity production. Following this, the development of electricity policy will be discussed in depth, with particular reference to policy from the 1950s onwards, before concluding with remarks on the relationship between electricity policy and the broader energy policy context.

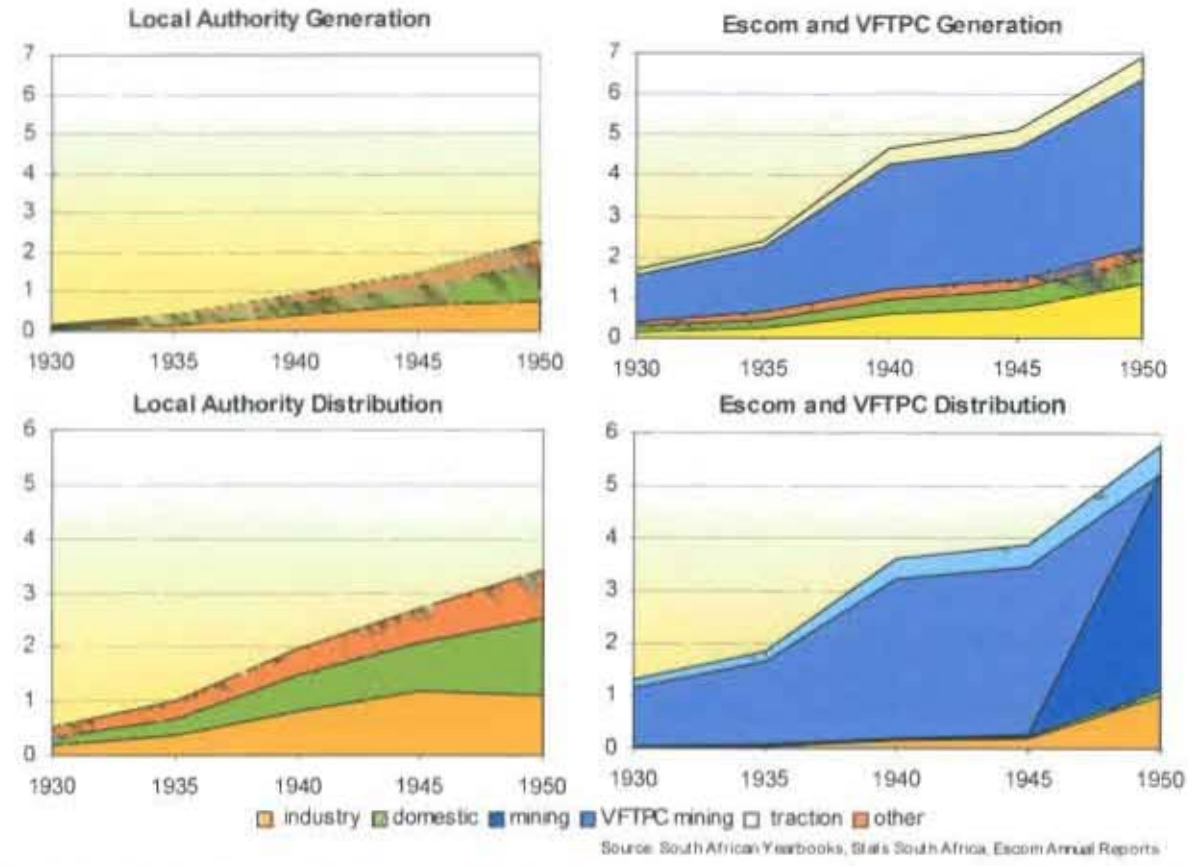
Structure, Actors and Institutions

a) Structure

What follows in this section is a brief outline which will be expanded more fully when discussing specific actors. As alluded to above, the fundamental dichotomy in the South African electricity system was between its role as a supplier of bulk power to energy-intensive industry and as a supplier of 'civic power' to a wide range of households and other enterprises, particularly in urban areas. The development of the system occurred in six phases, which were significantly influenced by the geography of the country in three ways: the first was the relative isolation of the major centres of economic activity; the second was the focus of economic activity around the goldfields, initially developed on the Witwatersrand; and the third was the location of the main coalfields, which were mainly concentrated in an area east of Johannesburg. In phase 1, from the late-19th century to the 1900s, tiny electricity systems were established by civic authorities in larger South African cities, and small electricity systems, mostly self-producers, were set up by the mines on the Witwatersrand. Phase 2 was inaugurated by the development of a private electricity generation monopoly on the Witwatersrand to provide electricity and compressed air to the rapidly-developing gold-mining industry in the late 1900s, the Victoria Falls and Transvaal Power Company (VFTPC). The VFTPC rapidly became the largest electricity supplier in the country, as mine consumption dwarfed the consumption of cities. The third phase began with the formation of the state utility Escom, in the early 1920s. Escom developed a number of 'undertakings' aimed primarily at producing bulk electricity for sale to local authorities, the railways and mines. Escom had a complex co-existence agreement with the VFTPC, which ended in the late 1940s with the expropriation of the VFPTC's assets, which signalled the beginning of phase 4. The relative production and sales of local authorities and Escom/VFTPC are portrayed in Figure 4.1 below.

Two things are immediately apparent: the dominant, but not yet monopoly role, of Escom/VFTPC in electricity generation, and the dominance of mining, both as a consumer, but also as Escom's dominant customer. During this phase of development, lasting until the early 1990s, three notable developments took place. The first was the extension of Escom's supply areas, and the construction of the national grid in the late 1960s and early 1970s. This is portrayed on the sequence of maps in Figure 4.2 below.

Figure 4.1: Patterns of Generation and Distribution in the South African Electricity System before 1950 (TWh)



The second major development was the statement of a formal policy in the 1960s recognising the division of roles between Escom and local authorities, whereby local authorities were to confine themselves to distributing electricity within their areas of supply; Escom would henceforth be responsible for further development of generation capacity, as well as providing electricity directly to energy-intensive users. The third major development, which confirmed and entrenched trends in electricity infrastructure development to that point, was the geographical division of urban and rural areas on a racial basis in terms of apartheid legislation, which directly affected development of the distribution industry. As a result of the completion of the grid, the institutional basis for the electricity system, the concept of 'undertakings' (separate electricity systems confined to a specific geographic area) was replaced by a global distinction between generation, transmission and distribution.

The fifth phase commenced in the late 1980s, and consisted of two elements. First, Eskom assumed control of most of the distribution areas in urban and rural areas previously controlled by 'black local authorities' under apartheid, and thus became a significant actor in the electricity distribution industry, and second, an international electricity transmission grid was developed in southern Africa, and a small but significant regional trade in electricity was established. Another significant development was the restructuring of post-apartheid local authorities, which led to the

amalgamation of many local authorities, and the concomitant redefinition of local authority distribution boundaries. The final phase was inaugurated by the transition process, and involved a number of abortive restructuring proposals for the entire system, but the future of these is currently uncertain. The role of specific actors and institutions within the system will be discussed in more detail below.

B) Key Actors

1) State Actors

A) Escom/Eskom

Probably the most significant actor pertaining to electricity policy is the state utility, the Electricity Supply Commission (Escom), until 1987, and then renamed Eskom. Escom was established legally in terms of the 1922 Electricity Act, and started operating in 1923. Escom's role as specified by the Act was both as a national electricity utility, which would supply electricity anywhere it was required, as well as an agency to promote electrification. Its duties included

> "..the investigation of new or additional facilities for the supply of electricity within any area, and for the co-ordination and co-operation of existing undertakings so as to stimulate the provision, wherever required, of a cheap and abundant supply of electricity" (Electricity Act 42/1922: Clause 3 (b)).

The way in which this role was interpreted through Eskom's 80-year history, by the utility and by the state, is surprisingly consistent, and is summed up by a distinction drawn in the 1984 De Villiers Commission report, between a "consumer-neutral" approach to electricity supply, in which electricity was viewed in the same way as other commodities in terms of price and investment ("..equal or tending to long-term marginal costs") and a "consumer-privileged" view, in which "..electricity is a basic ingredient of development and progress", and "..the community would benefit if it were made available as cheaply as possible to consumers and prospective consumers" (1983-84 Electricity Commission:192). The latter has consistently been subscribed to by Escom and its supporters in government and elsewhere. This view was first espoused by the founding Chairman of Escom, Hendrik van der Bijl, in the first Annual Report:

> "..the Commission regards cheap power as an important factor in promoting industrial development, and has, therefore, devoted, and will continue to devote, the closest attention to this aspect of its duties and responsibilities under the Electricity Act. It has had in its view from the outset the possibility of assisting industries by means of cheap power, and towards that end the desirability – given the nucleus of a power load – of producing power on a large scale in the vicinity of the coalfields" (Escom Annual Report 1923:5).

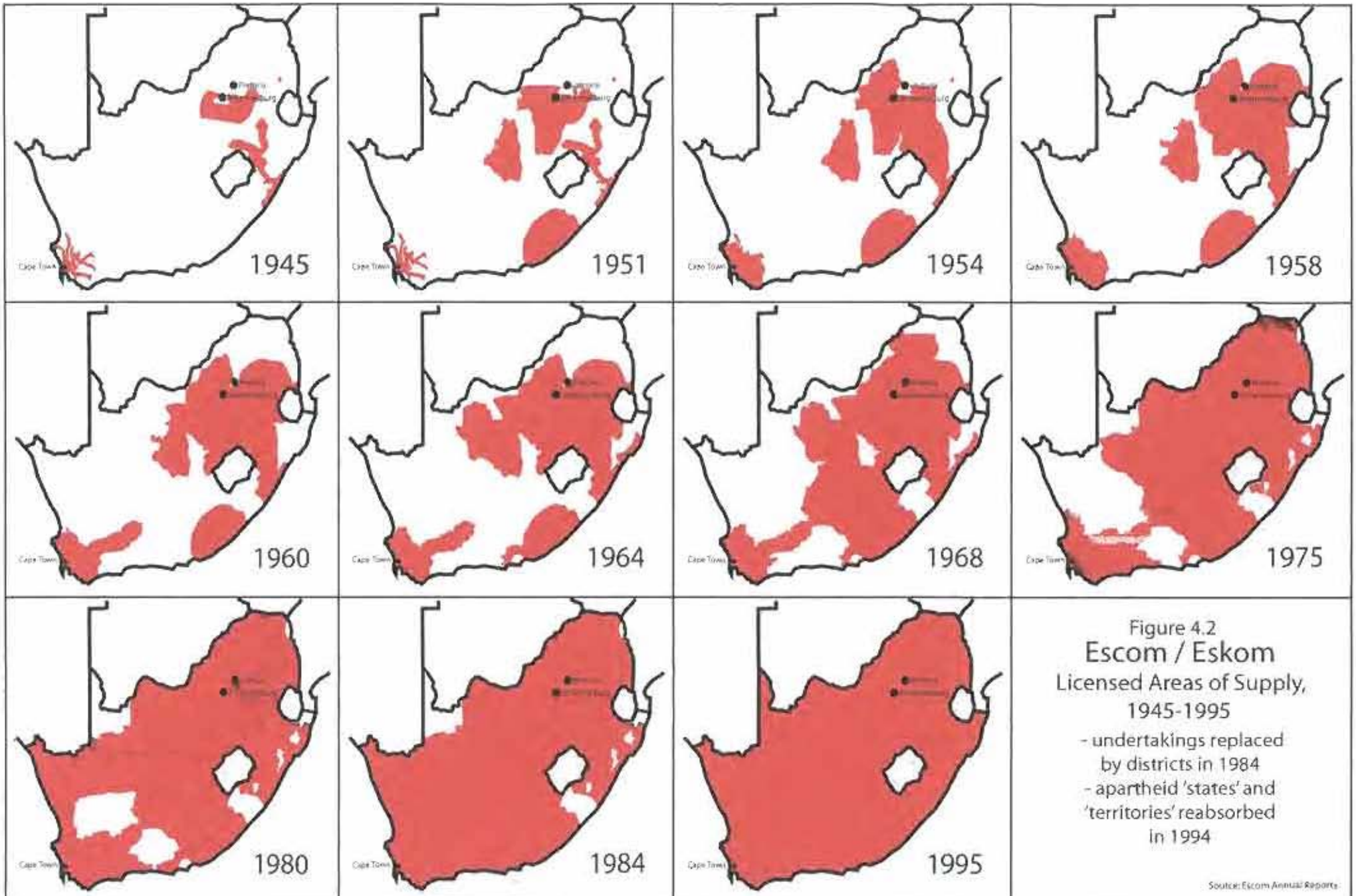


Figure 4.2
Escom / Eskom
Licensed Areas of Supply,
1945-1995
- undertakings replaced by districts in 1984
- apartheid 'states' and 'territories' reabsorbed in 1994

Source: Escom Annual Reports

By comparison, the 1984 Annual Report stated that

> "..Escom's objective is to provide an adequate supply of electricity, at cost price, to be used for the economic advancement of South Africa" (Escom Annual Report 1984:8).

Coupled with this role was a *facilitative* role (spelt out in Clause 3 of the original Act); until the 1960s, when Escom took over planning for the whole electricity system, the utility played a key role in negotiating arrangements for expansion of the electricity system. The 1943 Annual Report notes that

> "..while the Commission's function in this respect is purely advisory, it has, in a number of instances, been the means of bringing about co-ordination of electricity production and supply.. ..the transcending influence of the Commission's activities is noticeable throughout the Union, not only in its own areas of supply, which include many rural communities, hamlets and hundreds of farms, but also in areas of other suppliers, particularly in the field of price reduction and the consequent and diverse use of electricity" (Escom Annual Report 1943:14).

This role reinforced Escom's role, and its self-image, as *the* electricity agency of the country, assuming central responsibility both for its technical operation and expansion, and for the promotion of optimal solutions to electricity problems nationally. The expropriation of the VFTPC in the late 1940s and the subsequent development of the national grid concretised Escom's control of the operation and development of the electricity supply industry as a whole; processes to plan generation and transmission expansion for the whole country were centralised in Escom by the early 1970s, by which time Escom's direct sales to large consumers (excluding local authorities) were more than double the electricity distributed by local authorities.

From the late 1980s on, partly in anticipation of the transition, Eskom added to its traditional role of providing cheap electricity to industry a second role of "electricity for all", which involved a massive electrification programme aimed primarily at poor black households, as well as pioneering the development of a southern African electricity grid, as a prelude to a larger continental grid. This new 'social' role, undertaken on a tiny scale previously through the electrification of remote white farmhouses during apartheid, also involved assuming jurisdiction over around 40% of the electricity distribution in the country. Thus, the 1987 Annual Report portrays electricity as

> "..a key factor in spurring economic development and improving the quality of life of all our people. Eskom's aim is to ensure that electricity is affordable and, ultimately, available to all" (Eskom Annual Report 1987:cover).

This core vision thrived in the post-apartheid state, in the new context both of national development, and of the 'African Renaissance', in which Eskom was cast, both by itself and by

the South African state, as having a central role. In the 2002 Annual Report, the Chairman of Eskom stated that Eskom's core mission was "contributing to continental reawakening":

> "At the core of NEPAD and the African Renaissance vision is the acceptance that Africa's people and their institutions have the capacity and the responsibility to create, foster and maintain economic, political, social and moral processes and practices that define Africans as competent and proud citizens of the world, on par with the best. Our efforts are aimed at giving life to this belief." (Eskom Annual Report 2002:21).

In pursuing this vision, Eskom has always had a high degree of autonomy. Governance took place in four spheres. The first was the Electricity Supply Commission itself, headed by the Chairman of Escom, which oversaw Eskom from 1923 to 1985, and consisted of five people appointed by the state. This structure was replaced by a two-tier structure from 1985 to 2001: a Management Board dealt with the day-to-day running of the organisation, and an Electricity Council, the composition of which was specified by the Electricity Amendment Act (50/1985), which included a range of key government officials and stakeholder representatives representing key consumer groups. The Eskom Conversion Act (2001) abolished the two-tier structure and replaced it with an ordinary corporate governance structure.

The second was its nominal oversight by a government department: first the Department of Mines and Industry, until the formation of the Department of Commerce and Industry in the 1930s, the Department of Industry from the late 1960s, until 1980, when it came under the new Department of Mineral and Energy Affairs; at the end of the 1980s it was moved to the Office of Public Enterprise (OPE), which became a fully-fledged Department under the new government in 1994. In reality no departmental oversight was attempted until the late 1980s, when the Minister in charge of the OPE approved tariffs and other significant policy matters. From 1994 to the present, Eskom was accountable to the DMEA for electricity and energy policy matters, and to the Department of Public Enterprises as its principle shareholder. For most of this history, no capacity existed in these departments to oversee Escom or develop electricity policy, until the late 1990s.

The third sphere was regulation: Eskom's prices were not effectively regulated until the formation of the post-apartheid National Electricity Regulator in the 1990s; before this, regulators had very limited leeway to intervene in price-setting (see below). The fourth, and probably most important sphere, was an enduring relationship between Eskom and the political elite, both before, during and after apartheid. Since Eskom's formation, its leadership has had ready access to the premier, and what might be termed the 'industrial policy elite'. Key policy developments have usually been negotiated through these informal networks, rather than through

formal policy structures. After a brief period of uncertainty, these relationships have been re-established with the post-apartheid political elite.

B) Local Authorities

There were two key processes which structured the relationship between the electricity system and local authorities: the first was the institutional development of the electricity system, which defined the limited role of local authorities within the system, and the second was the development of spatial apartheid, which determined patterns of electricity distribution infrastructure development in racial terms.

Local authorities developed small electricity systems at the end of the 19th century: Kimberley in 1890, Johannesburg in 1891, Pretoria in 1892, Cape Town in 1895, Durban in 1897, East London in 1899, Bloemfontein in 1900 and Port Elizabeth in 1906 (Board of Trade and Industries 1978a:3). Institutional arrangements recognised local authorities' rights of supply within their areas of jurisdiction, an enduring right which was entrenched in the post-apartheid constitution. An exception, which was entrenched from the founding of the industry, was the right of Escom/VFTPC to supply large consumers such as mines within these areas of jurisdiction (Mountain 1994:65). Initially, local authorities generated significant quantities of their own electricity: in 1940, 47 out of a total of 187 local authorities with electricity reticulation systems purchased electricity from Escom, another local authority or a private supplier, and the rest owned their own generating plant (South African Yearbook 1940:887-890) and generated around 20% of the South African total. At the time, Escom generated around 60%, and the remainder was generated by self-producers or private companies (South African Yearbooks 1939 and 1940). The percentage generated by local authorities reached a peak of around 26% as self-producers switched to public supplies in the 1950s, and municipal capacity was expanded, but declined steadily until 2002, when only 7 local authorities had licensed and operating generation plant, and only two of these produced significant amounts of electricity: local authorities only produced 0.7% of electricity in 2002 (National Electricity Regulator 2002). This trend was reinforced by two developments: the completion of the national grid, and a sequence of policy developments which discouraged local authorities from expanding their generation capacity and eventually (through the 1987 Electricity Act) granted Eskom a veto[2] on the construction of new generation plant by local authorities. The impact of these developments was the centralisation of planning processes in Escom and the relegation of local authorities to a

[2] Previously, local authorities were required to apply to Provincial Administrators for permission to expand their generation capacity, who in turn were obliged to consult Eskom, which gave Eskom an informal veto (which depended on the co-operation of the Provincial Administrator). The new legislation gave Eskom a direct, formal veto on any applications for new generation capacity from local authorities.

niche role in electricity policy processes, which was mainly aimed at protecting their ability to raise revenue through electricity sales.

Racial zoning policies affected the electricity distribution industry in two ways. From 1913 onwards, rural areas were segregated into white farming zones and black 'homelands', which were granted various levels of 'independence' under apartheid; three of the 'independent states', Transkei, Venda and Bophutatswana ('independence' in 1976, 1979 and 1977 respectively) set up independent utilities, whereas Ciskei ('independent' in 1981) and the other 'self-governing territories' (Gazankulu, KaNgwane, Lebowa, Kwazulu) established government departments to distribute electricity bought from Eskom. Financially most of the utilities were unviable, having an almost non-existent industrial and commercial base, and a potential consumer base mostly comprising the very poor, and in most cases subsidising prices. Revenue collection was also at very low levels; both these factors served further to undermine investment (Conradie & Messerschmidt 2000:265, Davis 1997:125), which remained at very low levels until the end of apartheid.

Urban areas developed the same disparities; 'black' South Africans were removed to their specific 'group areas' under the Group Areas Act of 1950. 'White' areas included the majority of developed urban space, as well as the CBDs and industrial areas of almost every urban area, which meant that the rates base for 'white' areas was very significant. By contrast, 'black' areas, populated by and large only by the poor, who worked in 'white' areas, had a minimal rates base. These areas were administered indirectly through 'Black Advisory Boards' by white local authorities, which were replaced in 1961 by 'Urban Bantu Councils' (Christopher 1994:53). Administration of 'black' areas was removed entirely from 'white' local government in 1971 and vested in 'Bantu Affairs Administration Boards', controlled directly by central government through the Department of Bantu Administration and Development, who also took over the 'Urban Black Councils'. After 1976, the state sought to establish 'Community Councils' (Christopher 1994:55); in 1982 the government abolished these structures and replaced them with 'Black Local Authorities' (Horwitz 1994:33), both of which were 'representative' in some form. None of these structures attained any political legitimacy, and especially in the 1980s, political resistance, corruption, lack of capacity and lack of revenue rendered them ineffectual. In addition, during the period from the 1960s to the 1990s, urbanisation proceeded at a dramatic pace. In terms of apartheid legislation the conditions under which black South Africans could legally live in urban areas were tightly prescribed, so many new settlements were illegal, housing rudimentary and temporary, and infrastructure non-existent. A combination of neglect by white authorities, dysfunctional apartheid local government structures and lack of resources meant that by 1990 almost without exception every 'white' urban area (and most rural areas) was fully

electrified, whereas electrification rates in black urban areas were extremely low, and electricity infrastructure was correspondingly undeveloped. In addition, in most cases apartheid legislation required the separate development of infrastructure, which meant that distribution networks developed idiosyncratically in accordance with racial zoning in urban areas, with few interconnections (Horwitz 1994:7):

> "..sometimes a new non-white supply authority was created simply by separating the electricity network of the new authority from that of the mother municipality of which it had been an integral part" (Horwitz 1994:33).

Thus the development of both the urban and rural electricity distribution industries was profoundly influenced by apartheid, and led to massive disparities in infrastructure development and access to electricity. This affected not only households[3], but also other social infrastructure such as schools and clinics, as well as the development of entrepreneurial activity in these areas.

In the aftermath of apartheid, local and regional authorities were restructured. So-called 'homelands' were reincorporated into a new regional structure of provinces, and the corresponding electricity distribution authorities were taken over by Eskom and merged into their own distribution system. Local authorities were merged into 'Transitional Councils', for which elections were held in 1995 and 1996. Final boundaries for post-apartheid local authorities were drawn in the late 1990s, and elections held for these new authorities in 2000. A simultaneous process of rationalising and licensing new local authority distribution areas and tariff structures was undertaken by the National Electricity Regulator. Because of the nature of the restructuring process, distribution areas do not coincide with local authority boundaries, and most local authority distributors only distribute electricity in parts of their areas of jurisdiction. During the early 1990s, Eskom took over the distribution of electricity in all 'homeland' areas and in many formerly 'black' local authorities.

C) Regulatory Agencies, Government Departments and other State Agencies

From the 1920s, there have been three regulatory regimes overseeing the electricity system. The first was established in terms of the 1922 Electricity Act, and took over the licensing system (and the licenses which had been issued) from the Transvaal Power Act. The 1922 Act established the Electricity Control Board (ECB), the regulatory powers of which extended to holders of licenses, which excluded local authorities, government departments, the railways or self-producers not selling electricity, but included Escom (which for the purposes of regulation and statistics was classified as a 'private' producer) (Electricity Act 42/1922 Clause 19). Since in addition Escom had a legislative bar to setting an average price which made either a profit or a loss, and Escom's

[3] Impacts of non-electrical forms of energy (other than LPG) include health, safety, and security, as well as using up more resources of poor households (time, money), all of which exacerbate poverty.

spending was not under the control of the ECB, the ECB's task, aside from approving tariff increases for the VFTPC (the only significant other licensed electricity undertaking) was limited to approving changes in Escom's tariff structure. In reality, the Board had almost no capacity (having 3 to 5 board members and one staff member) to undertake sophisticated economic regulation, and although no records of the activity of the Board could be found before 1978[4], it seems that the Board's time was taken up playing a mediating and facilitative role in resolving disputes concerning rights to supply, holding hearings on land expropriation for electricity infrastructure, and addressing consumer grievances.

The Board of Trade and Industries (BTI) report into electricity tariffs in 1977-8 resulted in an extension of the ECB's role, based on the BTI's conclusion that both Escom and local authorities were under-regulated, and that the ECB lacked sufficient capacity. The Electricity Amendment Act (117/1979) enlarged the ECB from 5 to 7 persons, and its budget was increased. In addition, in line with BTI recommendations, it began a process of reviewing local authority tariff increases informally, which involved visiting major municipalities once a year and attempting to assess the levels of profit included in their electricity tariffs with the aim of limiting these to 10% (Interview with I Lambrechts); since the ECB could not direct local authorities to change their tariffs, 'excessive' tariff levels were noted and reported to the relevant Provincial Administrator, who could pressurise them to do so. Aside from the Board, the ECB had a staff of 1½[5], which made economic regulation difficult, if not impossible. The ECB was not successful in exerting any further influence over Escom.

The second regulatory regime was instituted in the wake of the De Villiers Commission, which reported in 1984. The Commission's brief had been to investigate, amongst other things, the role of the ECB, but in fact the Commission concentrated solely on Eskom, did not consider local authorities, and advocated a new governance structure which sidelined the ECB. In place of a licensing system, Escom (senior staff of which assisted in drafting the new legislation) was given an automatic right of supply to the whole country (thus removing it from the regulatory process); the Commission commented further that the diminished functions of the ECB could probably be performed by the DMEA. The abandonment of the 'neither at a profit nor a loss' formula meant that previous criteria applied to price increases were no longer valid. The new Eskom governance structure stipulated an Electricity Council consisting of major consumer groups and senior government officials, which partly performed the function of a regulator in that it liaised with government and had a veto on price increases. Such increases in practice involved the approval of the relevant Minister, which only applied until 1991, when Eskom won agreement

[4] In 1978, the ECB was enlarged and given more support, but anecdotal accounts indicate that the scope of pre-1978 activities was similar.

[5] Compare this with the current National Electricity Regulator's staff of around 100.

from the Cabinet for a 'price compact' specifying fixed average increases for 5 years[6]. Thus the regulatory regime during this period involved a complex institutional network involving the Electricity Council, the ECB (which continued its informal regulation of local authorities), and the relevant Minister.

The last (and current) regime began with the establishment of a National Electricity Regulator (NER) in 1995, a powerful independent regulator overseen by a Board, and financed through a levy on electricity. Unlike its predecessor, the ECB, it had a staff complement of around 100, which comprises the most significant body of expertise on the South African electricity system outside of Eskom. The regulator was established as part of a transitional negotiating process in the National Electrification Forum (1993-1995), and its function was seen as part economic regulation and part facilitation of a process of post-apartheid transformation within the industry. Through amendments to the Electricity Act (46/1994, 60/1995), the ECB was renamed the NER, a levy was introduced to fund it, and licensing for all distribution, transmission and generation operations was made compulsory, which required the licensing of all existing distributors, as well as Eskom's operations. Initially, the regulator was staffed by ex-Eskom employees, and headed by newly-retired Eskom CEO Ian McRae. The NER played a key role in both rationalising distribution tariffs (an ongoing process, which will probably culminate with the establishment of the REDs), and proposing and introducing a Wholesale Electricity Tariff pricing system, as well as a facilitation and monitoring role in the electrification programme. The NER is in the process of being converted into a National Energy Regulator, which will regulate electricity, gas and petroleum pipeline tariffs, and ultimately liquid fuels prices.

The Board of Trade and Industries' inquiry into the electricity industry in the 1970s made the salient point that there was no significant electricity policy-making capacity in the line department to which Escom reported (Board of Trade and Industries 1978a:158); up to this point, government departments (primarily the Department of Industries or its predecessors) had not had any significant involvement in electricity issues. However, from the 1970s onwards, attempts were made to incorporate electricity issues into an energy policy framework (with limited success), notably in the DMEA and the NEC. A policy capacity was finally created (following from electrification) in the DMEA in the late 1990s.

However, although electricity policy activity was largely centred in Escom, there was considerable interaction with other policy domains, including Provincial Administrators (before and during apartheid), the nuclear establishment, and a constellation of elite networks and committees around the premier, including the Economic Advisor to the Prime Minister, various cabinet subcommittees connected with economic or industrial policy, and various

[6] In nominal terms; the increase was fixed at below the estimated inflation rate, thus involving a real decrease in price.

interdepartmental committees dealing with economic and industrial strategy issues. Proto-industrial strategy developed before the second world war under the auspices of van der Bijl, who also founded the state iron and steel enterprise Iscor, as well as the Industrial Development Corporation (IDC). The latter organisation, established in 1940 to finance industrialisation and headed for three decades by van der Bijl's protégé Herman Van Eck, promoted a resource-intensive programme of industrialisation in which electricity played a key role. Apart from gold-mining, most other energy intensive projects during this period were associated with the IDC or Van Eck himself, including Sasol 1, 2 and 3, the Namibian utility SWAWEK, the funding of Cahora Bassa in Mozambique, hydro projects within South Africa, as well as key energy-intensive projects such as Alusaf and other energy-intensive smelting and minerals-processing projects. The extent to which Escom was integrated into these industrial policy neworks varied, and reached a crisis point in the late 1970s, which led ultimately to the De Villiers Commission.

2) Consumers

There are several identifiable groups of electricity consumers in South Africa, including 1) energy-intensive industries (including mining), 2) the railways, 3) local authorities, 4) white farmers/agricultural interests, 5) poor black households, and 6) local authority clients (including middle-class domestic users and commercial users). In terms of the criteria outlined in Chapter 1 for assessing the boundaries of policy communities, only groups 1 and 3 have had a persistent relationship with Escom and other key actors: the railways' significance declined before 1950, groups 4, 5 and 6 have exerted sporadic pressure (mainly through political parties), but the direct influence of small consumers has been insignificant (with the qualified exception of the electrification programme, which will be further discussed below). While local authorities have had a long co-operative relationship with Escom, their key focus has been the protection of their autonomy (which rests on the ability to tax local electricity sales), and forms a sub-domain of electricity policy.

By contrast, Escom's relationship with energy-intensive industries is historically one of the main cores of its *raison d'etre*. Direct electricity provision for mining and other industry dominated its history; sales to all other consumer types (including bulk sales to local authorities) comprised only around 25% in 1950, and only around 38% in 2000. In terms of the electricity system as a whole, the percentage of total sales to non-mining and non-industry consumers remained constant at around only 25% for the period 1950 to 2000. During this period, the electricity system, originally focused on providing bulk electricity for gold mining, formed the basis for the development of a cheap electricity-based industrial complex, at the heart of which were a small number of energy-intensive industries. These 'key industrial customers', defined by the NER as

> "..customers for whom electricity is 'fundamental to both international competitiveness and survival'", and for whom "..electricity represents a significant proportion of their input costs, often far in excess of 10%.." (Duperrut 1998:1),

were usually in industries involving mining, minerals processing or some form of mineral beneficiation. These were not only very price-sensitive because of the electricity-intensive nature of their industries, but also because of historically low South African electricity prices, have in many instances deployed more energy-intensive technologies than their competitors elsewhere (Duperrut 1998:8). The relationships between these and Escom have a number of relevant characteristics. First, because of the economic conditions under which these industries were developed (cheap electricity), there is a high degree of price sensitivity. Second, the close and continuous working relationship between Escom and these consumers was an important component of Escom's ability to manage the electricity system, as well as imparting a specific organisational culture to the utility. Ian McRae, head of generation in Escom in the 1970s and CEO in the 1980s and 1990s comments that:

> "If I go back right to my early days, the mining industry had a major impact.. ..they put a lot of pressure on Escom in ensuring good reliable supplies, the importance of this to the [mining] industry, both from an economic point of view, but also from a safety point of view, and there were liaison committees, and this all kept us up to scratch. I put a lot of emphasis, and gold stars if you like, in helping Escom to move into the kind of utility that it did. Then, behind that came the question of the other large industries, ferrochromes, chemical industries, a lot of the other big boys, and they too continued to put pressure on, also on tariffs; I think the mining industry and other industries did a lot through their pressure to ensure that we performed; but also helped us; I talked about this co-operation with load-shedding in that difficult period – it was wonderful" (Interview with I McRae).

Steyn indicates the profound impact on the organisational culture of Escom that engineers who entered the organisation in the 1950s, during a supply crisis linked to the rapid expansion of gold mining, brought to the leadership of the organisation in the 1970s, prioritising reliability, high reserve margins and relentlessly optimistic expansion programmes (Steyn 2001:72-3). As intimated by McRae, this influence was on-going, and the constant addition of energy-intensive projects to the economy during the 1970s and 1980s maintained and enhanced this outlook, which was shared by the industrial policy elite in government.

D) Research Centres

Although energy policy-focused research centres in South Africa had close ties with Eskom (especially the Energy Research Institute at the University of Cape Town, whose founding director had previously founded Escom's research section), the only one which significantly influenced energy policy was the Energy and Development Research Centre (EDRC) at the

University of Cape Town, which played a key role in initiating a political process around, and defining and negotiating the parameters of, the 1990s electrification programme, in the unusual context of the political transition.

Production, Demand and Price

1) Production

Since the completion of the national transmission grid, all major power plants in South Africa are located on various coalfields clustered in the north-east of the country, with the exception of one nuclear power plant located in the Western Cape. Throughout the history of the South African energy system, more than 90% of electricity has been generated from low-grade coal.

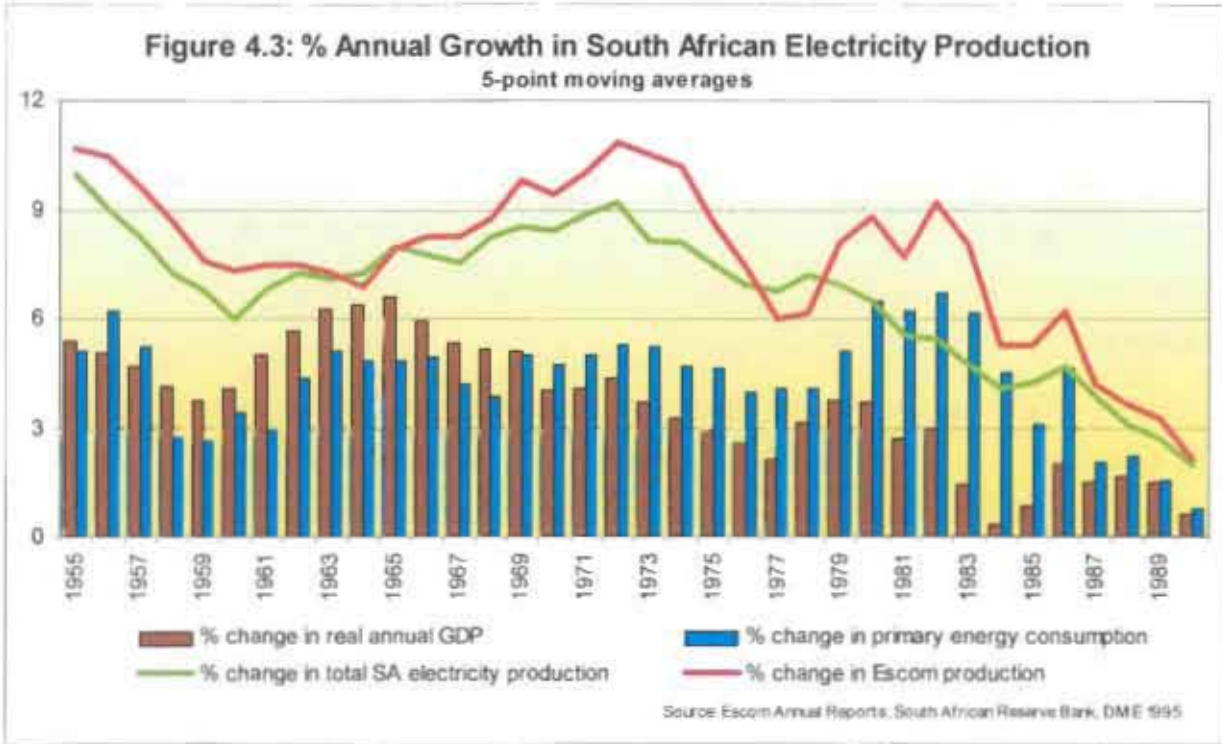
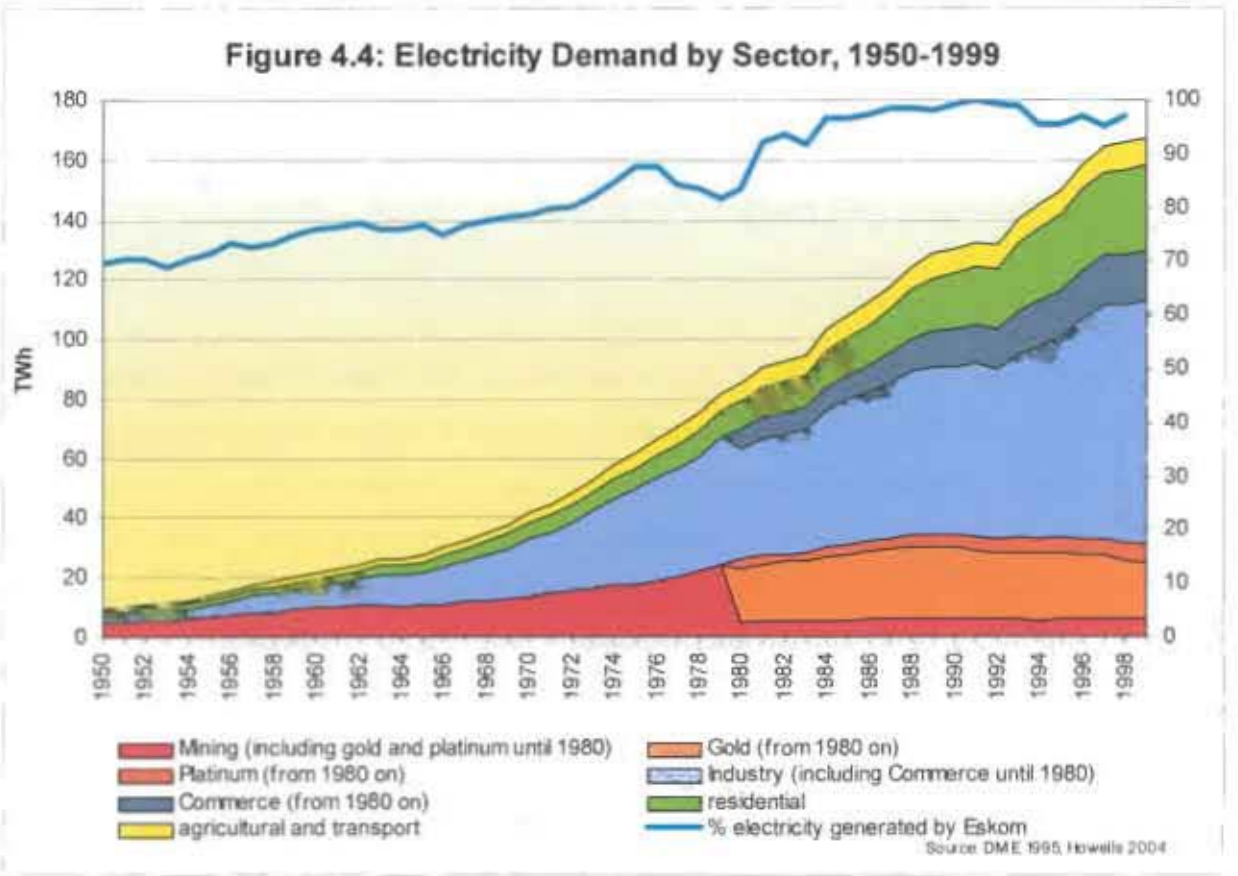


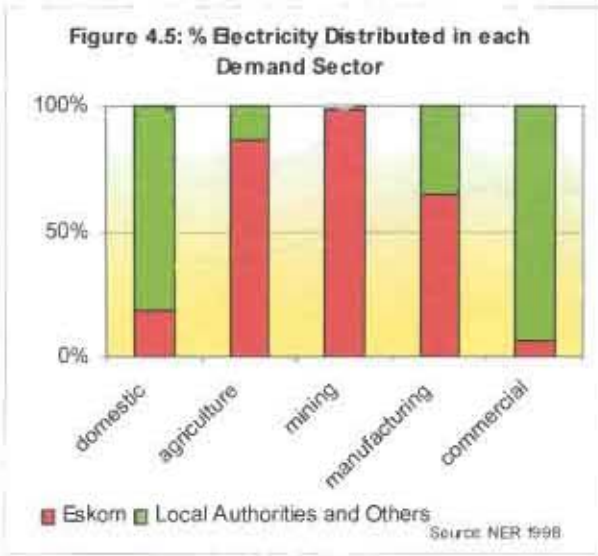
Figure 4.3 above illustrates a number of trends in electricity production: electricity production grew considerably faster than the economy throughout the period (until the last few years), with electricity booms in the 1950s and the 1970s; Escom production grew faster than production in the whole system as Escom gradually took over supplies to local authorities; growth slowed significantly during recessions in the 1970s and 1980s, and the economy developed a far higher energy intensity as growth in primary energy consumption increased faster than economic growth from 1970 onwards. Declining growth rates in production in periods from the early 1970s to the 90s was also an outcome of real price increases, which will be discussed below.

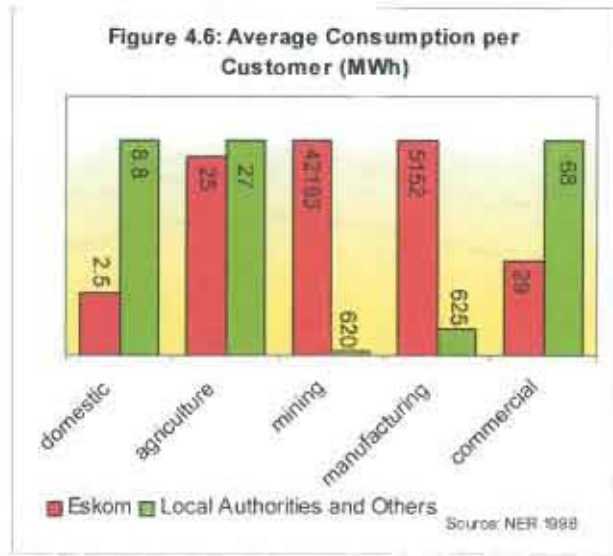


2) Demand

There are two significant aspects of electricity demand which are relevant to electricity policy: which sectors of the economy dominated demand in different periods, and how this electricity was distributed to them. Aggregated demand developed in three phases: until 1950, mining dominated electricity demand, supplied directly by Escom; from 1950 to 1980, demand grew at a very high rate, fuelled primarily by the development of a stream of energy-intensive industrial projects and a significant expansion of gold-mining; and from 1980 to 2000 demand growth slowed significantly, as gold mining activity declined, and the economy grew at a far slower rate. Demand by sector is portrayed in Figure 4.4 above.

The most notable factor in this graph is the growth in industrial demand; mining demand, dominant in 1950, grew less rapidly, and declined in the 1990s with the decline in gold mining demand. While Escom supplied almost all the electricity directly to the mining industry, the industrial sector was supplied partially directly through Escom and partially through local authorities; the percentage supplied directly by Escom increased from around 35% in 1950 to around 60% in 2004. Much of the electricity supplied directly by Escom to industry is supplied





to relatively few large energy-intensive industries[7]. Figures 4.5 and 4.6 above indicate the structure of the national electricity market in 1998.

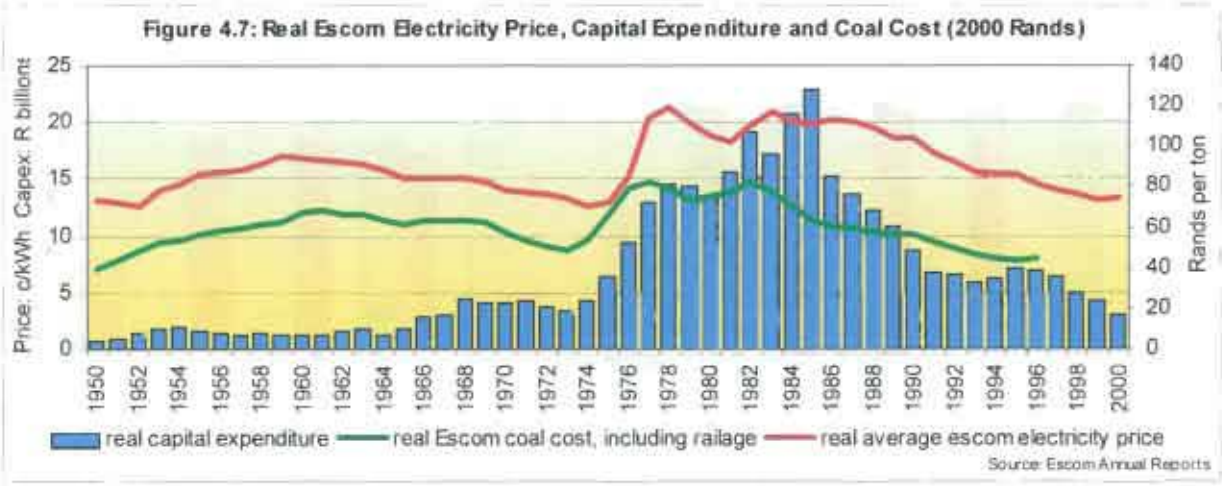
Figure 4.5 portrays the percentage of electricity which is distributed by Eskom and local authorities respectively to various classes of consumer. Since Eskom's domestic consumers consist of primarily poor households, and a large proportion are located in rural areas, the majority of electricity is distributed to households by local authorities. Figure 4.6[8] portrays the average size of Eskom and local authority's customers in different demand sectors; the average consumption of Eskom's domestic consumers is small by comparison to those of local authorities. Average consumption of agricultural consumers is almost the same for both suppliers, although Eskom supplies a significantly higher proportion. Mining consumers are still (as they have been since the 1900s) the domain of Eskom. The supply of manufacturing industries is split more evenly, but the average size of these customers is an order of magnitude larger in the case of Eskom; commercial customers, mainly situated in large local authorities, are supplied largely by local authorities. Thus, different consumer classes have relationships with different suppliers, which has a significant impact on their involvement in electricity policy activity, which will be further discussed below.

Price

The average cost of electricity production in South Africa, represented here by Escom's real average electricity price, is portrayed by Figure 4.7 below. There are three notable periods in this graph. During the first period, from 1950 to 1972, a major technical transformation occurred with the completion of the transmission grid, which led to two linked developments: all new

[7] According to the Energy Intensive Users Group, their members, comprising only 21 large electricity users (mainly mining and beneficiation enterprises), use 40% of the electricity sold by Escom every year (personal communication).

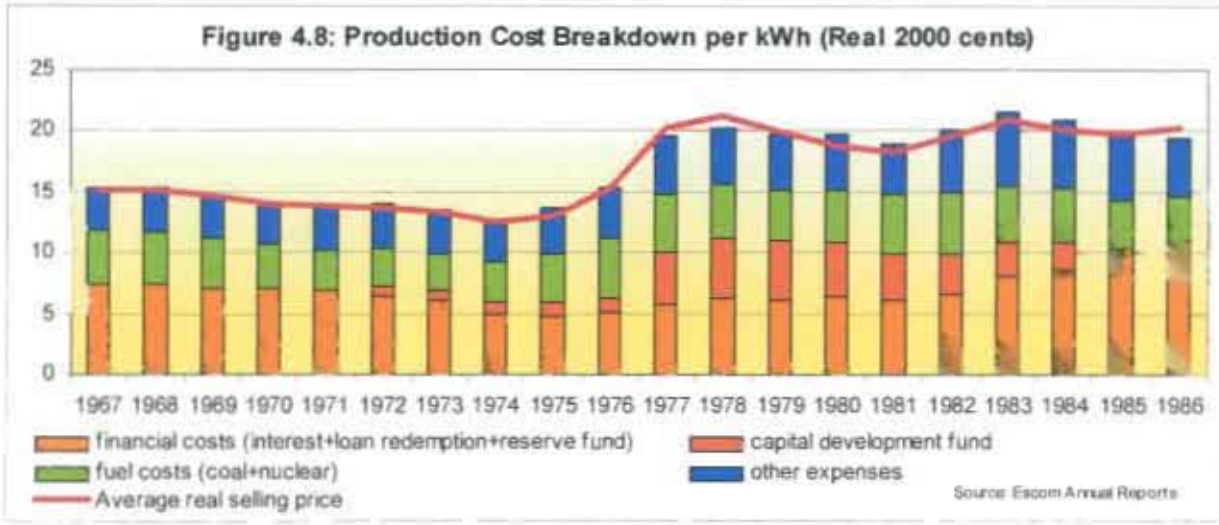
[8] The graph is actually five small graphs, since there is not a common scale across categories. What is reflected is the relative size of average customers in each category: the figures represent the size of the average customer.



plants were built at the pit head[9], thus eliminating coal railage, and plants increased significantly in size, a process which continued until the 1980s. Railage comprised a significant additional cost: in 1930, 61% of Escom's coal cost was for railage; in 1960 35%, in 1970 20%, and in 1980 only 6%, since by the end of the 1970s, the overwhelming majority of Escom power was generated by pithead power stations. Whereas the real price of coal was relatively constant during this period (see Chapter 3), Escom's coal cost declined from around 1960, which combined with other technical advances and economies of scale to bring about a decline in costs. The second period, from 1973 to 1986, saw a significant increase in prices, due primarily to an increase in coal costs (brought about by a change in coal policy), and the capital requirements of a massive capital investment programme, which was partly financed by electricity consumers. Although Escom bought most of its coal in terms of long-term contracts, these were tied to specific power plants; since between 1970 and 1982, Escom's installed capacity had tripled (Escom Annual Reports 1970 and 1982), and new contracts were concluded during this period for two-thirds of Escom's coal requirement, using the higher regulated price as a reference price. Until 1985, Escom was obliged to allocate costs so as to make neither a profit nor a loss, and therefore the average electricity price closely resembled accumulated production costs.

Figure 4.8 below portrays a breakdown of Escom's production costs during this period; the interaction of a number of factors contributed to a steep rise in the real electricity price from 1975 to 1978, a consistently higher price from then until 1988, and a steady decline from then until the present. There were a number of factors which contributed to this pattern. The key factor was the huge expansion programme launched by Escom in the early 1970s, in the expectation of high growth rates in electricity demand until the end of the century, which required massive financial resources. As foreign financing became more difficult to obtain, Escom utilised its Capital Development Fund, a facility for financing expansion from current

[9] This trend began several decades before, but the grid made it easier to transport electricity than coal to more remote markets.



sales[10]. The Fund was extensively utilised from 1976 onwards, when the Soweto Uprising made raising loans abroad much more difficult.

There was a sense of urgency during the 1970s and early 1980s about expanding generation capacity fuelled by a number of other factors: Escom had become dependent on Cahora Bassa[11], which was commissioned late, proved unreliable and was lost from the system in the early 1980s due to sabotage, which destabilised the Escom supply system. This was made worse by teething problems in the new large coal plants built in the 1970s, as well as an increase in the unit size of new plant, coupled with rapid industrial and mining demand growth. These pressures fuelled Escom's expansion drive in the 1970s and 1980s, but by 1983 growth in demand had begun to slow significantly, and Escom ended up with very significant over-capacity, largely paid for by consumers in the 1970s and 1980s. The real cost of coal surged during the same period, before declining in the late 1980s. While Escom's real coal costs (which were generally significantly below the regulated pithead price) declined steadily from 1955 to 1970, mainly on account of the shift to pithead power plants which eliminated the need for railage, the hike in coal prices and change in coal policy which followed the Petrick Commission had a significant effect on Escom coal prices. Although Escom prices were set by long-term contracts, the regulated price was used as a reference price, and the new power stations required the negotiation of new contracts (generally on a 'cost-plus' basis) which contracted for coal produced using more capital-intensive mining techniques, such as open-cast mining. In many instances, Escom provided part or all of the capital for these new mines, which added to the utility's capital burden. Another factor behind the increase was an increase in wages, particularly for black workers, who had

[10] In effect, a way of making consumers pay for capacity which will be required in the future.

[11] The Cahora Bassa project is a large hydropower scheme in Mozambique which was built in the 1960s and 70s. Due to the lack of a significant electricity market in Mozambique, most of the power is sold to Eskom. The 1500km transmission line linking Cahora Bassa to South Africa was repeatedly sabotaged by Renamo, a South African-backed rebel group, during the 1980s, and the link was only restored at the end of the 1990s.

begun to unionise again in the early 1970s and had successfully won wage increases across a range of industries; this trend continued into the 1990s.

The result of this overexpansion was a long period of relatively low capital expenditure, which led to a prolonged decline in electricity prices in the third period, from the late 1980s to the present, aided by the managerial reorganisation of Eskom in the wake of the De Villiers Commission which significantly improved the financial performance of the utility. From a policy point of view, the second period is the most significant: dramatic price rises in the late 1970s and the early 1980s led to a series of policy crises.

Until 1985 (under the 1922 and 1958 Electricity Acts), Escom's tariff structure was restricted by the principle that tariffs should be set so that a) Escom made neither a profit nor a loss, and b) cross-subsidisation between consumer classes was prohibited; tariffs were differentiated into only three classes (large, medium and small users) (Mountain 1994:76). From 1986, this relatively simple system was replaced in the wake of the De Villiers Commission with a pricing system which did away with the 'neither at a profit or a loss' stipulation, and a range of innovative tariffs were introduced, including time-of-use tariffs and customised tariffs for large users, which link pricing to commodity prices and other indicators, and often include arrangements for load-shifting (Mountain 1994:115). The 1998 White Paper on Energy established a policy goal of cost-reflective energy pricing, and the NER is currently introducing such a system to promote transparency in electricity pricing.

Electricity pricing by distributors has been much more complex and opaque. Before the 1990s, the tariff structure of Escom's distribution business was regulated, but not the price itself. Local authorities were not regulated at all, although the ECB did evolve informal mechanisms for monitoring prices. The result was that local authorities featured

> "..a multiplicity of different tariffs with essentially no justifiable economic reason for the difference in most of the tariffs offered by the different distributors.. [which] has led to the absurd situation where in some cases two adjacent customers supplied by different distributors are forced to pay completely different prices" (Mountain 1994:188).

This situation was also exacerbated by the significant variations in size between local authorities' supply areas, as well as the variation in the composition of their consumer bases. Two other predominant features of local authorities' pricing strategies were the significant cross-subsidies which flowed from other consumers to domestic consumers, and the addition of a surplus to the electricity price, which was used to subsidise other municipal services, effectively subsidising local taxes, which comprised a further transfer from other consumers to (usually white) residents (Mountain 1994:118). Mountain quotes a figure of R1.27 billion for this surplus for 1992 (Mountain 1994:119), representing a mark-up of between 11% and 23%; Barberton and Keswell

quote a figure for 1997 of R2 billion (Barberton & Keswell 1998:42), which represented 4.6% of total revenue raised by local authorities in that year[12]. Although a majority of local authorities do earn significant revenue through electricity sales, a minority actually make a significant loss on electricity distribution, through inefficiency and/or a lack of economy of scale or an unfavourable local factor or demand profile. In addition, because the distribution costs of local authorities are somewhat opaque, it is often difficult for regulators (or anyone else) to make judgements concerning the actual level of the surplus (Interview with I Lambrechts, board member of ECB and NER), since non-electricity assets were often included in the rate base. Since 1995, the NER has regulated local authority prices and has had as one of its central aims the rationalisation of these tariffs, a task which has been slowed by the significant reorganisation of local authorities which took place in the late 1990s, and the ongoing restructuring process in the distribution industry.

The Development of Electricity Policy

Electricity policy developed in South Africa in several distinct phases. In the first phase, from the early 1900s to the 1970s, institutional arrangements were established and consolidated, from the implementation of basic regulatory structures in the separate provinces to the 1922 Electricity Act, which founded Escom. By the late 1940s, with the expropriation of the only significant private producer, the VFTPC, Escom's position at the core of the electricity system was established; the completion of the national grid in the early 1970s consolidated this position, and also placed Escom at the heart of decision-making processes within the electricity system as a whole. While the aims of electricity policy (simple expansion of capacity to keep pace with demand) were in harmony with a broader policy context (industrial and economic policy), it was not contested in any significant way politically. However, from the mid-1970s, Escom's expansion programme began to have significant impacts on the electricity price, on local capital and on South Africa's foreign borrowing requirements.

This led to a series of policy crises, which comprised the second phase of policy development, beginning with a Board of Trade and Industries (BTI) inquiry into electricity tariffs, and culminating with the De Villiers Commission. Whereas the BTI inquiry had been framed in terms of traditional electricity policy, the De Villiers report placed electricity policy within a broader energy policy context, and advocated an institutional structure aimed at integrating electricity policy-related decision-making processes into a broader set of energy policy

[12] This figure includes local authorities which do not distribute electricity; hence it is more significant for those which do, averaging around 7% for these (Barberton & Keswell 1998:44)

institutions. The outcome, however, did not lead to further integration, but instead integrated Eskom into a different policy domain, aimed at reforming and privatising state enterprises.

In the third phase, from the late 1980s to the late 1990s, a transitional phase established a superficial consensus on post-apartheid electricity policy, based on the electrification programme, finalised jointly by Eskom and the ANC as part of the transitional negotiation process, and a programme of industry restructuring, linked conceptually to the electrification programme. The late-1990s Energy Policy White Paper espoused a policy consensus based on restructuring Eskom and the distribution industry, and introducing a competitive electricity market. However, in the (short) final fourth phase, this consensus collapsed, and government announced that the restructuring process for generation would be suspended indefinitely, and plans for distribution restructuring stalled. These phases, and their key corresponding events, are portrayed in Figure 4.9 below.

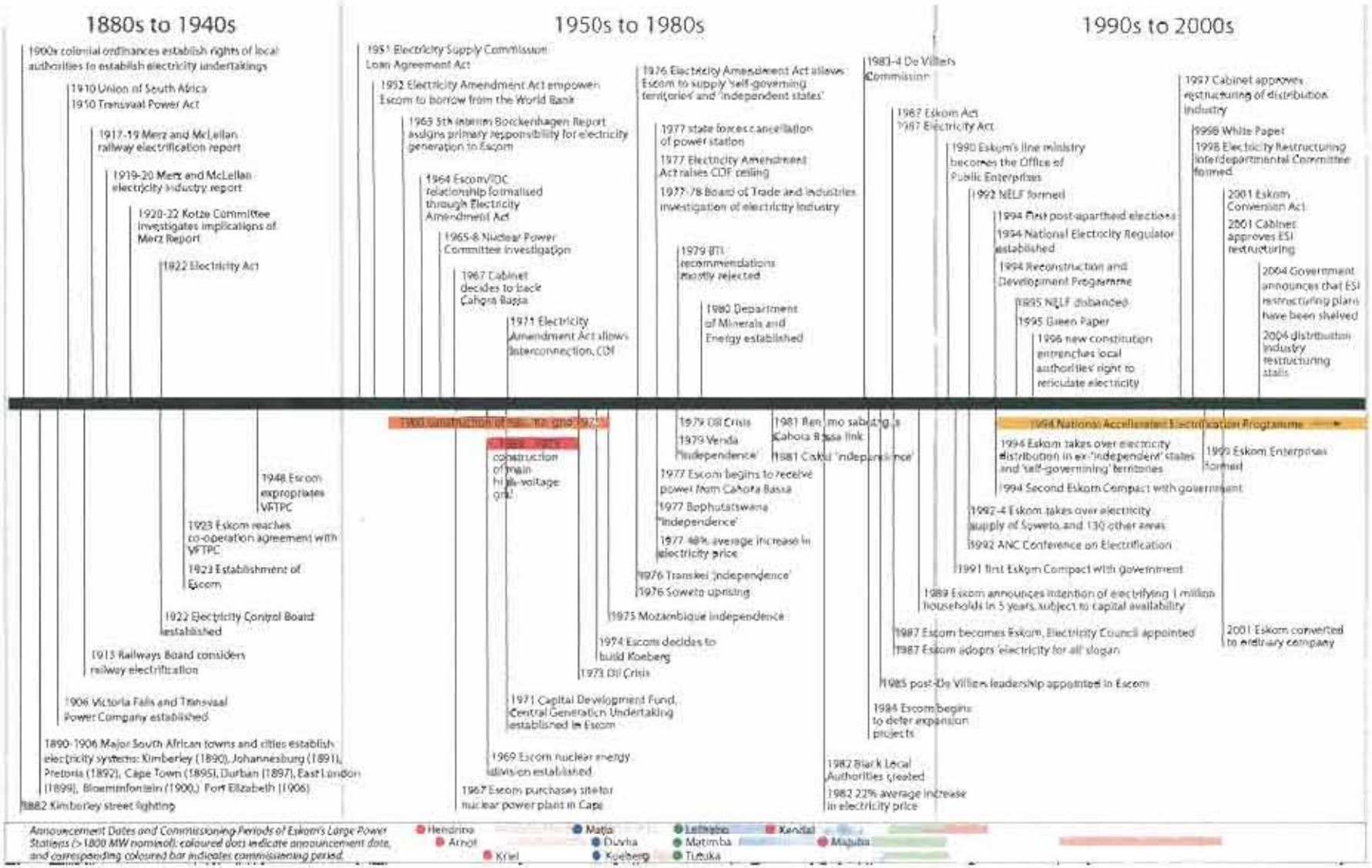
1) 1880s to 1940s

The period before the Act of Union in 1910 saw the emergence of two key regulatory instruments. The first was a response to the establishment of electricity undertakings by local authorities in the 1890s, and took the form of legislation based on the Board of Trade regulations regulating municipal electricity supply in the United Kingdom, passed separately in each province (then separate British colonies) (Mountain 1994:62), which subjected tariff levels to colonial Administrators' approval and recognised certain rights of supply within their areas of jurisdiction. The establishment of the VFTPC, primarily to provide power to the mines on the Witwatersrand, in the 1900s, led to the first active state concern with electricity supply, and resulted in the appointment of a Power Companies Commission in the Transvaal in 1909, headed by Sir Thomas Price, General Manager of the railways in the Transvaal (Christie 1984:40-41). One of the commissioners was the Government Mining Engineer in the Transvaal, Robert Kotze, who would be instrumental a decade later in the establishment of Escom. The Commission's conclusion was that a) there were significant advantages in large-scale production of electricity, b) this could be facilitated by private investment, and c) that

> "..since the supply of electric power leads to the establishment of a virtual monopoly in a commodity which has become practically a necessity of modern civilisation, it should, while being left as far as possible to private enterprise, at the same time be placed under government control and subjected to regulations which shall secure the equitable supply of power, the public safety, and public interests generally" (from Report of the Power Companies Commission, quoted in Christie 1984:42).

The way in which this last set of dilemmas was worked out was through the provisions of the Transvaal Power Act of 1910, which came into force only three days before the Transvaal was

Figure 4.9: Key Policy-related Developments in the Electricity Sector



amalgamated into the Union of South Africa; the Act was responsible for electricity regulation until 1922, and licenses and attached conditions granted in terms of it were effectively preserved until 1995[13]. The Act provided for the establishment of the Power Undertaking Board, which would licence and establish the boundaries of electricity undertakings; one of the conditions of licensing was that uniform rates had to be charged to all customers, and undertakings could be expropriated after 37 years (Conradie & Messerschmidt 2000:45). Local authorities would not have to apply for a license in their areas of jurisdiction; however, other parties (in the immediate case, the VFTPC) could apply for a license to establish a separate undertaking within a local authority's area of jurisdiction, subject to the veto of that authority in question. In addition, Section 5 of the Power Act established that certain types of consumer were excluded from the local authority's jurisdiction, including mining operations, railways and government departments; thus applications for licenses to supply these consumers were not subject to local authority veto (1963 Local Government Committee:2). This provision gave the VFTPC, and later Escom, access to its primary consumer base and established the basic institutional contours of the South African electricity system. The principle of expropriation after a few decades was included, against vehement opposition from the electricity and mining companies (the latter saw expropriation as a disincentive to investment – Christie 1984:44) to keep the option of further state involvement in the industry open, while guaranteeing a return on investment in the short term necessary to encourage investment on the scale required for the continuing electrification of the mines. The VFTPC was granted licenses for a large area of the Witwatersrand, in which a significant electricity infrastructure, mainly for supply to mines, was constructed in the following four decades.

Following Union in 1910, there was a series of key inquiries leading up to the next milestone in electricity legislation, the 1922 Electricity Act, which demonstrated a series of broader concerns. The first of these was concerned with the potential for railway electrification, which was considered by the Railways Board for the first time in 1913. The chief context for this interest was in the connection between the Natal coalfields and their two chief markets, the gold-producing area of the Transvaal, and Durban and the Natal coast; however the steep gradient posed challenges for the steam traction then available (Christie 1984:76). In 1917, William Hoy, the General manager of the SAR&H, commissioned a report from Merz and McLellan, "clearly the most experienced railway electrical engineers in the English-speaking world" (Christie 1984:78) on the possibility of railway electrification in South Africa. The firm completed its very positive report in 1919 outlining many advantages including higher speeds (more trains on each

[13] This applies primarily to the relationship between Escom and local authorities (1963 Local Government Committee:1); the way in which this was done was via the successive recognition of previous licensing conditions by new legislation, until the relicensing of all electricity infrastructure by the NER in 1995.

route), less wear, less infrastructure, less risk of fire and lower labour requirements. Key routes were identified for electrification including suburban lines in Cape Town and the Transvaal, and coalfields-connected lines in Natal and the Transvaal. These recommendations in fact formed the basis for the non-Witwatersrand spatial expansion of Escom until 1945, and "..laid the basis on which the provincial and national grids were built up" (Christie 1984:81), particularly given the sparse nature of South African settlements and urban centres.

This spatial conception of a proposed electricity infrastructure led to a more general question concerning the development of the electricity industry in South Africa; clearly there were significant opportunities for broader electrification based on the railway infrastructure, and also potential economies of scale to be achieved in supplying both industry and the railways. In addition there was another set of beneficial economic relationships between coal, transport and electricity: since at the time electricity could only be transmitted economically over relatively short distances, a good transport infrastructure from mine to power plant was essential. On the same basis, other heavy industries relying on coal and electricity could be established; as van der Bijl wrote in 1921:

> "..the electrification of the Union's railways.. ..can be made to be one of the most powerful factors in stimulating industrial development.. ..by bringing together two of the most important requirements of most industrial undertakings, namely power and transport facilities" (quoted in Christie 1984:77).

Smuts, the Prime Minister at the time, thus commissioned another report from Merz and McLellan on the question of the electricity industry generally, in 1919.

The report rested on two main points: the first was the importance of electrification as a basis for industrialisation (Christie 1984:81), and the second was the necessity of a process of orderly development (national technical standards/compatibility) in the electricity industry, which would give South Africa a competitive advantage (Steyn 2001:63). Merz concluded that

> "..the adoption of a definite policy as regards electricity supply is second only in importance to the provision of proper transport facilities" (quoted in Christie 1984:81).

Merz and McLellan's 1920 report thus proposed the establishment of a national regulatory agency to enforce national technical standards, regulate capital expenditure and prices, and direct new investment where required (Steyn 2001:63). Their model for the development of the electricity industry was to set up a regulatory commission, and then encourage both public (at the time mainly local authorities) and private investment in new capacity, subject to national development goals and technical standards.

In response the government appointed a committee chaired by Robert Kotze, the Government Mining Engineer[14], to investigate what action should be taken. Also on this committee was Hendrik van der Bijl, appointed in 1920 as the Prime Minister's Scientific and Technical Advisor, later the first Chairman of the state utility, who had a strong vision of state-driven industrial development, in which cheap electricity would play a significant part. Van der Bijl was also instrumental in establishing the state iron and steel manufacturer Iscor. The committee recommended a more ambitious programme than the Merz report, the key feature of which was the establishment of a national electricity utility, with a separate regulatory board. This utility would promote national electrification, both through being a supplier itself and playing a facilitative role in the establishment of other electricity projects.

The Electricity Act, which established both the regulatory authority, the Electricity Control Board (ECB), and the state electricity utility, the Electricity Supply Commission (Escom), was passed in 1922, and established the institutional framework for the electricity system for the next six decades. The ECB was tasked with licensing electricity undertakings; anyone supplying electricity except local authorities[15], the South African Railways and Harbours, a government department, or anyone generating electricity for their exclusive use would require a licence. As part of the licensing conditions, Clause 25(1) stated that

> "a licence shall contain a schedule of standard prices chargeable by the licencee for the supply of electricity to the various classes of consumers, and the board may provide for a periodic revision of such schedule" (Electricity Act 42/1922).

'Surplus profits' (defined in the Act) of licencees other than the Commission should be returned to consumers, and licencees had an obligation to supply in their licensed areas. Thirty eight years after a licence was issued, the Governor General had the power, "after obtaining reports from the Commission and the Board", to

> "..give to the licensee not less than two years' notice of his intention to expropriate the undertaking and, upon the expiry of that notice, shall authorise the commission to expropriate the undertaking" (Clauses 19-31, Electricity Act 42/1922).

The Act set out Escom's responsibilities, which were to promote the establishment of a cheap national supply of electricity by investigating the establishment of new or additional electricity supply in any area, "establishing and maintaining new supply undertakings with the purpose of ensuring a sufficient supply of electricity", "co-ordination and co-operation with existing undertakings to ensure cheap and sufficient supply of electricity" and advising Provincial Administrators on proposals from local authorities for new or expanded electricity supply, and

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[14] The mining-related bureaucracy in the Union was adopted wholesale from that developed in the Transvaal up to 1910, which included the Government Mining Engineer.

[15] Local authorities outside their area of jurisdiction would also require a license.

whether Escom would be better placed to provide electricity. Although local authorities were exempt from licensing, they had to apply to the Provincial Administrator for permission to establish or expand undertakings (Steyn 2001:64-65), who then had to consult Escom[16].

The basic pricing principle of the Commission was contained in Clause 10 (4):

> "It shall be a general principle of the commission that its undertakings shall, as far as practicable, be carried out neither at a profit or a loss, and that its charges shall be adjusted accordingly from time to time" (Electricity Act 42/1922).

These prices should cover

> "(a) the cost of production, including distribution, maintenance and administration; (b) the amounts required for interest on money raised by way of loan.. ..(c) the amounts to be set aside under Section 9[17]" (Clause 10(1), Electricity Act 42/1922)).

Thus, expansion would be financed only through loans. For the first seven years, Escom was allowed to borrow from the Treasury, but after that it had to raise its own loans (Davis 1997:125). Undertakings were ring-fenced in terms of the 'neither profit nor loss' formula; cross-subsidies between undertakings was prohibited.

The rationale behind these institutional arrangements, and Escom's role, was elaborated later by the utility's first chairman, van der Bijl:

> "..the problem was to provide a cheap and efficient supply in a sparsely populated country, with small towns and villages many miles apart. Lack of capital was the biggest difficulty of all. No private company would supply electricity to all these isolated places without expecting a large profit, but if profits were to be allowed for, the price of electricity would be prohibitive either for domestic or industrial purposes. On the other hand, if government undertook the supply it would mean a monopoly and consequent loss of efficiency, and this would prevent municipal schemes from going ahead on their own" (quoted in Conradie & Messerschmidt 2000:71).

Thus, Escom was to be a 'supplier of last resort', in any circumstance in which an undertaking would not run at a loss. From its outset, Escom was not regarded as a 'government' organisation, but an 'independent' one, which was forcefully restated by van der Bijl in the 1930s in response to queries concerning its autonomy from MPs:

> "Various sources provide a considerable amount of evidence as to the trend of opinion on the question of State versus private enterprise. During the past decade, however, a growing disposition is manifesting itself to consider the possibilities of combining the advantages of both systems while guarding against their respective disabilities, especially in the matter of public utilities such as water, electricity, transportation and intelligence communication

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[16] In practice, this applied to generation, but not to distribution, since local authorities effectively had a veto on applications for distribution rights in their areas of jurisdiction.

[17] Provision for a reserve fund for maintenance and replacement.

[telecommunications]. The South African Electricity Act is one of the foremost experiments having this objective.." (quoted in Conradie & Messerschmidt 2000:91).

As the 1931 Annual Report stated:

> "..the Commission operates strictly on business lines, is outside political control and, except in the matter of tariffs falling within the jurisdiction of the Electricity Control Board, is vested with complete responsibility for the conduct of its own affairs" (Escom Annual Report 1931:8).

Oversight of the organisation was carried out by a 'Commission' of around five people appointed by the Governor-General[18] (later the relevant Minister); this process of appointment constituted the only direct involvement by the government in Escom until the 1980s. As a result, Escom's role was delineated in largely technical terms, which were underpinned by a reverence for national economic development, and the vanguard role of electricity in this process. In his last report as Chairman, van der Bijl wrote in 1948:

> "..our inspiration has derived from faith in the future of our country. Still a young and vigorous land in a world grown old and perhaps weary, South Africa possesses abundant resources which her virile people will not leave undeveloped.." (Escom Annual Report 1948:6).

From the 1920s to the end of the 1940s, Escom negotiated a series of working arrangements with local authorities and the VFTPC, which were based on synergies between the requirements of local authorities, railway electrification, and mining. In order to prevent further entrenchment of the VFTPC in the most significant South African electricity market, Escom negotiated a complex arrangement whereby further plants built on the VFTPC's system would be owned by Escom but operated by the VFTPC (Christie 1984:87), since Escom itself only began to generate electricity in 1926 (Escom Annual Report 1926:1).

By the end of the 1940s, a significant consensus had emerged in favour of expropriating the VFTPC's remaining assets (a minority of power plants, but an extensive distribution network), which was backed by three influential groups. The first was Escom itself, which had by then achieved a significant presence in the main electricity markets of the country. The second was the emerging industrial policy elite within the state, which had, since the early 1940s, begun to develop a vision for the country's broader industrialisation, since at the time the economy was based almost entirely on mining and agriculture. The industrialisation vision was based on the utilisation of natural resources and the development of a number of 'infrastructure industries' which would provide cheap industrial inputs to mining and secondary industry. The emerging

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[18] Since South Africa was first part of the British Empire, and later the Commonwealth, the Governor-General was the British monarch's representative to the South African government, and had similar (if mainly formal) powers as the British monarch had in relation to the government of the United Kingdom, including theoretically the right to dismiss a government.

focus for this industrialisation strategy was the Industrial Development Corporation, founded in 1940 and chaired initially by van der Bijl (Christie 1984:123, 142). van der Bijl's protégé, Herman Van Eck (who began his career at Escom), headed a 1940 Commission of Inquiry into 'Industrial and Agricultural Requirements, which "established the fundamental industrialisation policy of the following decades" (Christie 1984:123) based on the progressive development of primary industries and cheap labour largely driven by the state. The 'infrastructure industries', including transport, communications, iron and steel and electricity, would ideally be parastatals, which would have three advantages: first, they could operate without the investor-driven requirement for a market-related rate of return (essential to provide inputs for the economy at cost), second, they would make necessary high-risk, low-return investments, and third, multiple dimensions of the state's development policies could be pursued through them. The VFTPC was an obstacle to this at the heart of the electricity system (Christie 1984:143), the excess profits of which would hamper industrialisation.

The third significant group was the gold-mining industry, which saw Escom's takeover of the VFTPC as immensely beneficial, since it would entail an almost immediate drop in electricity prices in an industry which was increasing its energy intensity every year. The expropriation negotiations were largely controlled by the 'Gold Producers' Committee' representing the gold mines, which although it

> "..had no *locus standi* in the matter, insinuated itself completely into the negotiations, even to the point of issuing demands and ultimatums, and prescribing matters to the main negotiating partners.." (Conradie & Messerschmidt 2000:101),

in order to minimise the price paid by the government for the utility to guarantee low future electricity prices (Christie 1984:144-5). The government approved Escom's offer of £14.5 million, the biggest single transaction up to that time in South Africa. Escom's asset base grew from £29 million to £45 million, its staff complement grew from 2692 to 7850, and most significantly, it immediately became the dominant electricity producer in the country with a virtual monopoly on supply to the railways, the gold mines and other emerging heavy industry (Conradie & Messerschmidt 2000:105).

2) 1950s to 1980s

The period from the 1950s to the 1980s began with the expropriation of the VFTPC, which confirmed Escom's status as the core of the electricity supply system. Policy changes in the 1960s enhanced this role by relegating the role of local authority electricity undertakings to distribution. This, and a simultaneous technical development, placed the institutional function of planning future expansion of the electricity system solely in the hands of Escom, whose main

task during the period was to expand electricity supply as rapidly as possible. A number of factors, including declining growth rates in electricity consumption, concomitant recurrent recessions, obstacles to foreign borrowing, and an increase in coal costs and a related increase in electricity prices, led to a series of policy crises in the late 1970s and early 1980s, which led in turn to a series of significant institutional reforms.

Escom Moves to Centre Stage 1950-1980

The theme which dominated the electricity supply industry between 1950 and 1980 was how to increase supply fast enough: electricity demand grew at a rate of between 6% and 9% for the whole of these three decades. At the same time, growth of Escom's own output was at a much higher level, since Escom gradually took over most of the generation of electricity in South Africa during this period. In 1950, the percentage of total electricity sent out produced by Escom was 69%; by 1984, the same figure was 96% (Escom Annual Reports). This constant level of growth in electricity demand, consistently higher than the growth of the economy as a whole, and even higher in Escom's case, produced an organisational culture based on continuous expansion, which was inaugurated by a series of supply crises in the decade immediately following the war, and entrenched by two decades of stable economic growth.

The decade following the war posed unique problems due to an international lack of capital equipment (due to post-war economic recovery), as well as unprecedented capital requirements. Escom and the South African government used various kinds of leverage in the early 1950s to prioritise equipment shipments, including loan agreements (Escom Annual Report 1950:6) and leverage through the Combined Development Agency[19] (Escom Annual Report 1951:6) to persuade the UK to prioritise electricity-related capital equipment used in 'uranium production'; since uranium was a by-product of gold mining, this applied to most capital equipment imported at the time. The late 1940s, 1950s and 1960s saw rapid expansion of gold mining with the opening up of new mining areas (the Free State) and new deep-level mines, all requiring considerable investment in infrastructure and rapidly-increasing demand. In the early 1950s, power shortages necessitated close co-operation with the gold industry (Christie 1984:155) to manage the electricity system, and the mining industry, and other energy-intensive industries afterwards, became an integral part of both Escom's planning system[20] and the management of the electricity system, since they had the capacity to predict and if necessary shed load (unlike local authorities), and could, for safety and technical reasons, not afford unplanned loss of load.

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[19] The Combined Development Agency was a joint US-UK initiative to source uranium for their respective weapons programmes from the 1940s to the 1960s, and since South Africa was one of the main global producers at that stage, the CDA bought South Africa's entire production during this time. Since in South Africa uranium is a by-product of gold mining, electricity infrastructure for uranium production covered a large percentage of total electricity produced in the 1950s – see Chapter 5.

[20] The Chamber of Mines produced detailed demand growth forecasts for the mining industry annually for Escom.

At the same time, their requirements became one of the key drivers of Escom's organisational culture, and the concrete manifestation of Escom's commitment to economic development;

> "..it was understood that the mining industry was the prime driver behind the establishment of the ESI and it was therefore inconceivable that its development should ever be stunted by shortages or poor quality of supply. The importance of the gold mining industry was underscored by the many high level meetings that were held with them in the 1950s and 1960s to discuss their needs." (Steyn 2001:72).

In 1951 parliament passed the Electricity Supply Commission Loan Agreement Act (1/1951), and amended the Electricity Act (Electricity Amendment Act 66/1952) the following year to allow Escom to borrow money from the World Bank (guaranteed by the state) to fund its expansion programmes, which formed part of a broader massive infrastructure development project associated with the development of the Free State goldfields (Fine & Rustomjee 1996:155). Rapid expansion of Escom's output was maintained at high levels from 1950 to 1984, averaging between 8%-10% until 1977, with very high periods in the early 1950s and early 1970s between 9% and 12% (Escom Annual Reports).

A simultaneous development, which occurred mainly between 1960 and 1975 (Christie 1984:163), was the integration of separate electricity undertakings into a national electricity system via the construction of a national grid by Escom; the core high-voltage transmission network was completed between 1969 and 1973 (Conradie & Messerschmidt 2000:135). The development of the national grid had a profound effect on the technical capacity of the electricity system: it led rapidly to the concentration of generation plant on the coal mines, and the concomitant achievement of significant economies of scale in generation. It also significantly changed the economics of electricity generation, since power from Escom's coal-fired plant on the coalfields could compete with local generation (which generally burned coal which had been transported from the same area). This development was accompanied by two policy changes.

The first was in the form of a report by the Borckenhagen Committee, appointed to inquire into the "Financial relations between the Central Government, the Provinces and the Local Authorities". The Fifth Interim Borckenhagen Report, tabled in 1963, included in its investigation "The supply of Electricity in Escom License Areas" (1963 Local Government Committee), the aim of which was to resolve questions of jurisdiction in electricity supply. The main question which was raised by local authorities concerned the right of Escom to extend its statutory right to supply mines, railways and government departments to the supply of industry in general. While the Committee concluded that

> "..Escom should as far as possible confine its activities to that of producer and wholesaler of electric power leaving retail distribution to local authorities and similar bodies" (1963 Local Government Committee:18),

it also insisted that "..in all areas falling under a licence of Escom it should be regarded as the duty of Escom to afford protection to industrial consumers to the extent of Escom's applicable tariffs" (1963 Local Government Committee:18), thus entrenching Escom's right to supply energy-intensive industries directly. A second, and equally if not more significant outcome, was that the Committee found that

> "..the main task of meeting the country's requirements of electricity should be undertaken by Escom, and that further expansion of municipal generating stations in areas which could be supplied by Escom be discouraged" (1963 Local Government Committee:15).

This was a reversal of the 'co-existence' policy of the 1920s and 1930s, and an affirmation of Escom's primary role in electricity supply. The Report was included in a White Paper tabled in 1971, which effectively put an end to local authorities expanding their generation capacity. Thus, in 1968 and 1969, in what turned out to be a test case, Johannesburg applied to the Provincial Adminstrator to build a new power plant, and permission was refused three times on advice from Escom, and the city eventually concluded a bulk supply agreement with Escom in 1972 (Financial Mail 19/1/1968, Financial Mail 20/3/70, Christie 1984:164). No further applications were made by local authorities, and no significant generation capacity was subsequently built by local authorities. The prospect of an 'Escom monopoly' aroused unease amongst the business press, who feared that Escom could be used to "further ideological economics" of the apartheid state (Financial Mail 19/1/1968). From an institutional point of view, this development divided the electricity system into two domains, one of which, occupied by Escom, became the central site for deliberation on electricity policy. The other, occupied by local authorities, did not form part of electricity policy deliberations until the 1980s, and its development was tied to the development of apartheid spatial policies. This separation

> "..not only led to the proliferation of distribution authorities and tariffs, but also meant that domestic electricity supply became closely associated with apartheid policy" (Davis 1997:125).

The second policy change was an institutional reform which belatedly recognised the new reality of a centralised electricity system, in the form of the Electricity Amendment Act (49/1971), which promulgated a mechanism for electricity to be transferred from one undertaking to another (Electricity Amendment Act 49/1971), as well as for allocating costs from one undertaking to another.

Escom swiftly established the Central Generating Undertaking (CGU), a separate 'undertaking' into which all generation assets was transferred. The CGU thus centralised both the operation of plant, which led to efficiencies by amalgamation of demand curves as well as by 'merit order' operation of plant (Conradie & Messerschmidt 2000:143), and the planning process for adding additional generation plant to the national system, since by the late 1960s, "Escom had to plan its

investment in generation capacity to meet the growth in demand of the country as a whole" (Steyn 2001:72). The planning function, previously located in separate undertakings (and individual local authorities), was replaced by a generation and transmission planning unit based in the CGU (Interview with I McRae, head of the CGU in the 1970s). The CGU thus became the centre for "..planning and control for Escom as a whole" (Conradie & Messerschmidt 2000:231), and the undertakings were relegated to a marginal role.

In this context, Escom embarked on its most ambitious capacity expansion plan yet at the beginning of the 1970s. In 1969, the sent-out rating of Escom's plant was around 6500MW, and it had a further 3600MW under construction; in the decade from 1969 to 1979, Escom announced, began construction on and completed some of a capacity expansion programme to add nominal capacity of around 25 000MW, and in the following three years, another 11 000MW was announced (Escom Annual Reports, Conradie & Messerschmidt 2000:114). The US decision in the early 1970s to delink gold and the dollar led to a boom in the gold industry, and the ironic effect of the oil crisis was to strengthen gold demand and boost the global gold price, which led to a boom in gold production in South Africa. This involved considerable expansion in existing gold mines, which in turn led to a surge in electricity demand, putting pressure on the electricity system throughout the 1970s. In addition to this, a series of other energy-intensive projects were completed and commissioned from the late 1960s to the mid 1980s, including minerals beneficiation, synthetic fuels production, uranium enrichment and processing, and expansions to the country's iron and steel production infrastructure. Some additional demand was also created by local authorities and others which relied on crude-based fuels switching to electricity (or buying power from Escom) after the oil crisis (Steyn 2001:75).

The expansion plans were primarily based on increasingly large pithead coal-fired plants, Escom's core technology, which had been progressively adapted for South African conditions in two ways: 'dry cooling' systems were introduced, which used far less water (which is a very scarce resource in South Africa, and a potential limit on power plant construction), and combustion technology was adapted to burn high-ash, low-calorific value coal, which was extremely cheap and abundant. A notable exception was one nuclear power plant, consisting of two French-built pressurised water reactors in the Western Cape (see below).

The scale of the expansion programme posed significant financing challenges for Escom, which had begun to dominate the local capital markets, as well as foreign exchange markets. In addition, foreign banks were beginning to refuse to lend capital to South African companies because of apartheid. The solution to this problem proposed by Escom to the state was the formation of a Capital Development Fund (CDF) in 1971 (which was promulgated in terms of the Electricity Amendment Act (49/1971), Clause 13) from an annual percentage of Escom's

total revenue, which would buy Escom stocks, on which interest would be paid into the fund. This proposal was welcomed by the Treasury because of its potential to relieve pressure on the capital markets (Financial Mail 8/1/71). While interest paid by Escom on the stocks to the CDF was an internal transfer, according to Escom's fund accounting system it constituted a cost and could be reflected in the tariff. Thus, if CDF contributions became significant, consumers would effectively be paying both the contribution and the interest on the contribution. The 1971 Electricity Amendment Act in fact authorised the creation of such a fund, subject to a cap of 3% of outstanding loan debt per annum, and not exceeding a total of 15% of total loans (Conradie & Messerschmidt 2000:142). This was later considerably extended by another Electricity Amendment Act (102/1977) to allow further internal financing after the Soweto uprising of 1976 made foreign borrowing far more difficult. In the period after 1976, CDF contributions were increased significantly, until consumers were in effect paying more than one-fifth of their electricity bills towards future expansion (Conradie & Messerschmidt 2000:228).

Linkages to Other Policy Contexts

Although, as outlined above, Escom attained a high degree of decision-making autonomy in determining the future of the electricity supply system, the utility was not immune to influence from other policy domains; understanding the nature and extent of this influence is important in understanding Escom's relationship with the state during this period. Significant influence occurred in four different categories: the first consisted of apartheid-influenced social goals, specifically the electrification of 'white' rural areas; the second consisted of a sequence of industrial/infrastructural projects; the third consisted of a set of objectives associated with Escom's coal contracts, and the last consisted of Escom's complex relationship with the nuclear establishment.

The electrification of 'white' rural areas (white-owned farms[21] and small settlements) by Escom was partly the outcome of the institutional arrangements underpinning local government in the pre-1994 state: local authorities only had jurisdiction over urban areas, and were thus not obliged to supply power to areas further afield. Thus, rural areas were those areas which fell outside the area of a jurisdiction of a local authority; this distinction, which was the basis for much policy and social statistical analysis, was abolished by the post-apartheid government when local government was restructured in the late 1990s, and rural areas were all included in a local authority.

Rural electrification was undertaken by Escom only if it would pay for itself (in terms of the Electricity Act), until 1947, when the farm lobby, which in South Africa was economically less

[21] In most cases this excluded the electrification of black farmworkers' houses on the farm.

important than it was politically influential[22], pressured the government into passing an amendment to the Electricity Act (44/1947), in terms of which the relevant Minister could direct Escom to supply electricity below cost in certain areas; the difference was then paid to Escom from the fiscus (i.e. a subsidy).

The immediate basis for this Amendment, which opened the way for Escom's involvement in a range of government-backed regional rural development projects and drove much of the spatial expansion of Escom's supply areas between 1945 and 1985, was an alliance between farmers, businesspeople and the diamond miner De Beers in the 1940s, who organised themselves into the Northern Cape Development Association to lobby for an Escom undertaking in the northern Cape, which was duly established in 1951 (Conradie & Messerschmidt 2000:110, Christie 1984:154). The process of electrifying farms and subsidising farm supplies accelerated significantly during the 1970s and 1980s (Christie 1984:184, Escom Annual Reports, Conradie & Messerschmidt 2000:286), given added impetus by the government's eagerness to electrify farms in border areas for strategic reasons. The reforms of the mid 1980s which abandoned the 'neither profit nor loss' formula also did away with the prohibition on cross-subsidisation, although it is not clear whether in fact the additional cost of rural supply was funded by the fiscus in the 1970s and early 1980s; in 1982, the cost of this programme to Escom was quoted by a journalist as R100 million per year (Financial Mail 5/3/1982). Connections to white farms were heavily subsidised by Escom in the 1980s, funded by cross-subsidisation from other consumers (Conradie & Messerschmidt 2000:286). The sunk cost in rural electrification was such that Eskom started a marketing organisation in the late 1980s, Agrelek, to boost farm consumption of electricity to cover the cost of rural networks.

The second category consisted of a series of infrastructural projects in which Escom was involved in the 1960s and 1970s. The common factor in these projects was the involvement of the industrial policy elite, the IDC, and the Chairman of the IDC, Hermann Van Eck, and Escom's involvement was usually brokered at Cabinet level. The IDC's relationship with Escom was legally promulgated in 1964 via the Electricity Amendment Act (10/1964), which created a "legal relationship between Escom and the Industrial Development Corporation", empowering Escom to

> "act as the agent of the Corporation [IDC] in any territory outside the Republic in regard to anything which the corporation may do in such territory in connection with the generation, supply or distribution of electricity" (Aims, Electricity Amendment Act 10/1964).

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[22] White farmers not only formed an important political base for both the United Party (which governed up to 1948) and the National Party (which governed afterwards); they also had a disproportionate influence on the electoral process through the constituency system, since rural constituencies (before 1994) had on average fewer voters than urban ones. In addition, many pre-1994 MPs had personal ties to rural areas.

The aim of this was to allow Escom to manage and operate the then South West African electricity utility SWAWEK[23], a subsidiary of the IDC (Conradie & Messerschmidt 2000:139-140), while also establishing the model for supplies to other apartheid entities (within South Africa's borders), as well as relationships with other projects such as Cahora Bassa. While the SWAWEK project had various advantages for Escom, a number of other subsequent projects did not. These included a series of dams on the Orange river, part of an ill-conceived regional development project in which Escom's participation was required to improve the legitimacy and economic feasibility of the project. The basis for the project was a messianic view of 'white' wealth and development in the region by the then Prime Minister Hendrik Verwoerd (quoted in Conradie & Messerschmidt 2000:150). Although the associated hydroelectric schemes were usefully incorporated into Escom's regional electricity system, the economic and technical case for Escom's involvement was not strong at the time[24], and their involvement was brokered once again by Van Eck (Christie 1984:167-8, Conradie & Messerschmidt 2000:154): Escom, however, paid only for the installed equipment, and did not contribute to the cost of the dam. The other, more controversial project which Escom was pressured to take part in was the Cahora Bassa hydroelectric project in northern Mozambique. The project was proposed by the Portuguese colonial regime in Mozambique in the early 1960s, and supported by the apartheid government as a strategic measure to bolster the colonial government, and thus maintain apartheid South Africa's cordon of settler-dominated states against the wave of independence movements sweeping the continent. Because of the lack of a significant industrial economy in Mozambique, the country lacked a market for a large hydroelectricity project, and the colonial government proposed that Escom agree to buy a considerable amount of the project's output (Conradie & Messerschmidt 2000:170). The Cabinet agreed to the proposal as part of a broader southern African project also aimed at supporting the Smith regime in Rhodesia, in addition to boosting the South African construction industry (Christie 1984:166). Escom initially demurred, but Cabinet pressure over a three-year period resulted in Escom agreeing to buying all Cahora Bassa's output by the end of the 1970s, and the project was built into its planning process; Escom also funded the South African leg of the DC transmission line, and the project itself received funding from the IDC (Conradie & Messerschmidt 2000:173). Since the colonial regime in Mozambique was overthrown in 1974, by the time that electricity began to flow south (at the end of the 1970s), the South African-backed rebel Renamo movement had begun to

[23] Afrikaans acronym for Suid-Wes Afrika Water en Elektrisiteitskorporasie (South West African Water and Electricity Corporation)

[24] Escom's official history argues that at the time, in the mid-60s, there was not a strong technical rationale for the projects, but that this improved significantly after the main transmission line to the Cape had been constructed at the beginning of the 1970s; since the hydro projects were sited half way along this line, they became much more useful.

sabotage the transmission lines, and by the early 1980s, no further electricity reached South Africa until the line was restored in the late 1990s.

The third category of influence was exercised on the nature of long-term coal contracts, which were fundamental to Escom's operations, and also comprised the economic base of the coal industry: before the 1970s, Escom contracts comprised a high and growing proportion of the coal market (around 50%), and during the 1970s and after, export permits were in most cases linked to Escom contracts. This presented the state with an unprecedented opportunity, which was made use of in two phases. In the first phase, one of the key objectives of the post-1948 government (O'Meara 96:74-80) was the promotion of Afrikaner capital in an 'English'-dominated economy, and particularly in the mining sector, which was in the 1950s and 1960s still the core of the economy. New independent Afrikaner-owned collieries were given preferential access to rail transport during the shortages in the 1950s to supply Escom and export markets (Christie 1984:154), which gave them enough leverage to be admitted to the TCOA cartel. Coal assets were then utilised to enter the gold industry, the key mining sector in South Africa until the 1990s. In the 1960s, the key strategic acquisition for Afrikaner mining capital was the mining group Genmin[25] by Federale Mynbou in 1964; the basis for Federale Mynbou's financial muscle in the 1960s was the awarding of four out of the five long-term Escom contracts in the 1960s to its consolidated coal group, TNC (Fine & Rustomjee 1996:160), which by 1962 was the second-largest coal group in the country.

In the second phase, in the post-Petrick coal policy framework, Escom coal contracts were tied to specific goals such as increased extraction rates. These were reinforced by giving preference in the issuing of export quotas to coal groups involved in long-term Escom contracts, which was simultaneously aimed at increasing the efficiency of coal resource use, as well as keeping Escom's coal prices down through exporting beneficiated coal (see previous chapter, DMEA Annual Reports 1980-1984). The coal mining revolution which accompanied these reforms was mutually beneficial, since dramatically-increased extraction rates combined with beneficiation and Escom's improved combustion technology significantly extended the lives of both coal reserves in general (by increasing extraction rates and using previously non-economic grades of coal which did not form part of the reserve calculations), and the lifetime of specific deposits, which extended the economic life of associated power plants.

[25] In the 1970s, Escom continued its traditions of 'Afrikaner empowerment' by signing a contract with Gencor (the consolidated Genmin and Federale Mynbou) for the provision of natural uranium (to be enriched in the US as fuel for Koeberg), rather than one of the established uranium producers. The contract included a deal to fund the establishment of a processing plant.

The final category of influence concerns the commitment to invest in nuclear power, made by Escom in the late 1960s[26], following a web of highly secretive decision-making processes and strategic manoeuvres. This involved the establishment of a nuclear engineering capacity within Escom, which ultimately led to a decision to build the Koeberg nuclear power plant in 1974 (Conradie & Messerschmidt 2000:205). Since these processes are discussed in detail in the next chapter, what follows is a brief précis of the relevant features. What the nuclear establishment proposed was a nuclear-industrial complex, including a large-scale enrichment facility and ultimately an indigenous reactor technology. In the medium term, nuclear power would replace coal as the core technology of South Africa's electricity system. From the early 1960s, attempts were made to obtain commitment from Escom to a nuclear programme, without which these visions would lack legitimacy: these efforts, brokered again by Van Eck and the nuclear policy advocates in the Cabinet, bore limited fruit at the end of the 1960s, but Escom limited its commitment to one power plant, and its expansion programme effectively ruled out more plants for at least two decades. The result, therefore, was a stalemate, and the nuclear establishment was limited to a (very expensive) small-scale fuel cycle, which effectively involved a significant subsidy from Escom until the early 1990s.

There are several conclusions relevant to electricity policy processes which follow from the above narratives. The first concerns the institutional and political status of Escom: because of its position in relation to the state, its relative autonomy and its relative prestige, influence was brought to bear on Escom in every case by an informal network consisting of a political and industrial elite, rather than through a line function. The second consists of an assessment of the *extent* of Escom's autonomy; during the 1960s and 1970s, the utility possessed a significant capacity to resist state initiatives, and where necessary to accommodate them on its own terms. The extent to which 'outside' policy initiatives were accommodated was different in different cases; this can be measured in terms of the impact of the proposed measure on Escom's 'core activity', the generation of low-cost coal-fired power, and its ability to make autonomous decisions in that regard, which will be referred to below as Escom's 'core autonomy', which comprised the utility's ability to dominate or monopolise electricity policy processes. Electrification of rural areas was accommodated over a couple of decades, since the political benefit was high and the cost relatively low, with no impact on key decision-making processes. Coal policy initiatives were actively accommodated, since there were political benefits, and benefits to Escom's core activity; dam projects were resisted, but accommodated, since they intruded on Escom's planning autonomy, and the nuclear programme was accommodated but

[26] The exact point at which Escom committed itself to nuclear power is debatable, and around 1968 is the conclusion reached by the current author –see next chapter for a more detailed discussion.

sidelined. A strong nuclear programme would have threatened Escom's autonomy, but non-involvement would potentially have threatened Escom's monopoly, a fear which the AEB exploited. What followed in the 1970s was a direct threat to Escom's core autonomy by the state; Escom's resistance ultimately forced the state to resort to what Smith refers to as 'despotic power' (see Chapter 1), or a forceful reconstruction of the constellation of interests comprising a specific policy domain.

Policy Crises and Reform, 1977-1985

The above period encompasses one of the three most significant periods of electricity policy change in South Africa, the other two being the 1920s, when the basic institutional structure of the industry was established, and the transitional period during the 1990s. Events in this period are focused around two public inquiries: the first being an investigation of electricity tariffs by the Board of Trade and Industries, commissioned in 1977 and reporting in 1978, and the second being the De Villiers Commission, appointed in 1983, and reporting in 1984. Most literature on this period (Steyn 2001, Mountain 1994, Conradie & Messerschmidt 2000) emphasises the continuity between the two reports, in that there was significant common ground in their recommendations. The resulting narrative of the crisis is that it resulted from specific institutional arrangements in the electricity system, which led to a crisis which could be ignored in the late 1970s, but not by the early 1980s, primarily based on adherence to an outdated planning paradigm by Escom. While this is indisputable, from a policy point of view the way in which the separate crises were constituted and the way in which the inquiries were framed was significantly different, and indicated a considerable and important shift in the structure of the electricity policy environment.

The widely-accepted image of Escom, which distinguished it from many other parastatals, was of a highly-successful technocratic enterprise at the vanguard of economic development in South Africa. Media coverage of Escom in the early and mid 1970s was generally conducted in a faint tone of awe. The decade was begun with a piece in the Financial Mail headed "Future Belongs to Escom" (Financial Mail 20/3/1970); this and other subsequent stories emphasised the Herculean task faced by Escom in increasing its generating capacity to keep pace with economic growth, and the success, despite occasional blackouts, with which this task was being undertaken (the message of "Escom can Cope" (Financial Mail 22/2/1974) was that despite the size of the challenge, there would be no blackouts). By the mid-1970s, Escom's leadership began to emphasise in public that security of supply would come at a price, in the form of price hikes, which the economy must endure in order to maintain security of supply. What was required, according to Jan Smith, Escom general manager and later chairman, was an ability to think and

plan boldly; he warned at a conference in 1975 that the days of super-cheap electricity were over; energy shortages in South Africa, he said, would not come from scarcity of resources, but from an unwillingness to bite the bullet, and finance the infrastructure necessary to provide sufficient energy resources in the future (Financial Mail 27/6/1975). The broad acceptance of this dominant narrative was undermined by two factors which emerged from 1975 to 1977, and forced government to consider intervention. These were high annual increases in electricity prices, which had remained stable for around two decades, and Escom's increasing capital requirements, which had grown to such an extent that they began to affect local capital markets, as well as foreign markets to which South African enterprises had access, as well as the availability of foreign exchange.

In the mid-1970s, elements within the state had become aware of the impact of Escom's capital requirements, as its massive expansion programme began to dominate capital markets. As a percentage of gross domestic fixed investment, Escom's share of the South African total had risen from an average of 4% from 1968 to 1974, to 6% in 1975, to 8% in 1976 and to 12% in 1977. Net inflows of foreign capital were also dominated by Escom, which consumed 20% of the net inflow in 1975, and 61.2% of the net inflow in 1976. In 1977,

> "..Escom still had large net foreign borrowing receipts while the economy as a whole experienced a very large net outflow" (Board of Trade and Industries 1978a:117-119).

At the same time, other large capital-intensive strategic projects were in mid-construction, particularly Sasol 2 (with another Sasol pending), armaments projects, and a number of capital-intensive export-orientated minerals beneficiation projects which the state had identified as key to addressing critical balance-of-payments problems. These projects were being pursued and co-ordinated by a network centred on economic planning processes in the Department of Planning and the Economic Advisor to the Prime Minister. Since domestic capital resources were scarce, and additional foreign borrowing had become more difficult or impossible in certain cases after 1976, the Department of Finance established an Interdepartmental Committee for the Determination of Capital Investment Priorities, based in the Department of Finance. However the Committee had "..insufficient powers to curb what they believe is an innate expansionist drive of the state utilities" (Financial Mail 7/3/80), including Escom. During the 1977 recession, government had forced Escom to scrap a proposed 3600MW power plant from their short-term planning horizon (Financial Mail 17/12/1982).

This schism between Escom and state economic planners was augmented by mounting consumer pressure over sharp price increases. There had been, since 1975, a stark upward increase in real average electricity prices (see Figure 4.7 above), driven by inflation as well as a real increase in fuel costs of 23% in 1975 and 20% in 1976. After a long period of declining real prices, Escom's

average electricity price increased in nominal terms by 16% in 1975 and 30% in 1976 (against an inflation rate of around 12% for each year), which led to consumer protests, particularly by energy-intensive users and farmers.

Government's response to these two problems was twofold. First, in early 1977, the Minister of Economic Affairs asked the Board of Trade and Industries (BTI) to investigate electricity tariff structures, the effect these had on the economy, the effect of regional tariff differentiation, the relationship between Escom and local authority tariffs, and

> "..the adequacy of existing legal implications affecting the tariff policy and tariff structure in respect of the supply of electricity" (Board of Trade and Industries 1978a:1).

The BTI was the Department of Commerce's trade and competition institution, whose normal activities involved investigating applications for anti-dumping duties, and reporting on alleged monopoly practices in specific industries. The inquiry took around one year, and was the first independent investigation into the electricity system by an independent body since 1920.

The state's second response was to pass the Electricity Amendment Act (102/1977), which permitted Escom to expand the CDF considerably, both as a solution to the capital problem, and as compensation for lack of availability of foreign loans in the wake of the 1976 Soweto uprising, which considerably increased foreign pressure on the apartheid state. Included in the 1977 Amendment was a less-conspicuous clause (10A) which authorised the Minister, after consulting the ECB, to direct that up to 3% of Escom's income be paid into a fund to subsidise energy-intensive users as part of an export-incentive scheme (Board of Trade and Industries 1978a:28), which was partly aimed at protecting export-oriented energy intensive industries against electricity price increases.

The Amendment resulted in a real increase of 255% in the CDF component of the electricity price, at which level it remained until it began to decline from 1981 to 1984, when the fund was abolished. However real total finance charges (fund contributions plus interest) remained at the same level throughout this period (Escom Annual Report 1985); thus, real finance costs declined from around 7 to 5 c/kWh (real 2000 cents) from 1967 to 1976, and rose abruptly in 1977 to between 10 and 11c/kWh from 1977 to 1986. The result was a series of staggering price increases, which were more dramatic given the inflationary climate at the time. Escom's average electricity price rose 48% in 1977 in nominal terms (inflation around 12%) during the BTI inquiry, which put government on the defensive politically since the Amendment had been defended in parliament against charges that it would lead to further dramatic price increases (Financial Mail 16/7/77).

The Board's investigation drew on the services of an expert in corporate finance (Professor I Lambrechts), considered the electricity industry generally, including local authorities, the

broader economic context, and specifically Escom's opaque accounting and operational system. The investigation was framed, like other BTI investigations, in terms of the internal dynamics of the electricity industry, and did not link electricity policy to a broader energy policy context. It produced a detailed set of recommendations, which included the following (Board of Trade and Industries 1978a:157-8):

1. Escom's fund accounting system should be abolished, since it was not only misleading but also resulted in material inflation of costs through charging interest on internal funds as costs.
2. There was a general lack of planning and control systems in Escom, and particularly financial planning and control; these should be put in place as soon as possible.
3. Extreme caution should be exercised by Escom in determining future reserve margins – if possible, better maintenance systems etc should be put in place instead of large reserve margins; future capital projects should be postponed or cancelled if possible.
4. The CDF should be scrapped; instead, Escom should be able to earn a profit, and should not pay tax on this. The level of profitability should be regulated by the Department of Industries, as should the level of internal financing.
5. A Capital Projects Evaluation Group should be established in the Department of Finance to consider all state corporations' capital projects, which should be subject to Cabinet approval.
6. Further changes to the Electricity Act should be approved by the ECB.
7. The ECB and the Department of Industries should be resourced so as to be able to effectively oversee Escom and the rest of the industry.
8. Local Authorities should take over reticulation of Escom's small consumers if possible.
9. Provincial Administrators should "..control the electricity tariff levels in terms of profitability [of local authorities] to prevent excessive surpluses" – local authorities should also move to more transparent accounting systems (Board of Trade and Industries 1978a:151). The Report also noted that "..the average increases in the tariffs of the responding municipalities for the different consumer groups.. ..were higher than those of Escom" (Board of Trade and Industries 1978a:150).

The Report thus posed significant challenges to the institutional autonomy of both Escom and local authorities, but particularly to Escom. Aside from criticising Escom's management procedures, it proposed that a range of oversight functions be put in place which would have brought Escom under significantly closer political control. Another key feature was the

strengthening of the ECB. However, other government policy priorities and the pre-emptive tactics of Escom resulted in most of the Board's recommendations not being accepted in 1979.

On the whole, government was not inclined to implement these recommendations, which was a symptom that the pro-reform faction in various state agencies had been sidelined by Escom's successful attempt to restore its tarnished credibility with the political elite. Escom was able to achieve this by a combination of strategies. The Board's recommendations on management changes (2)[27] were implemented before the release of the Report (Conradie & Messerschmidt 2000:231-2). Escom's two main strategies however, involved discrediting the main findings of the report by claiming that it had misunderstood its fund accounting system (Steyn 2001:93) (1), and by reducing the real price from 1979 onwards by offsetting the loss against the following year, as specified in the Electricity Act (Steyn 2001:94). The government was in turn not prepared to scrap the CDF (4), and rejected the idea of a Capital Projects Evaluation Group (5) as political interference.

Recommendations which were accepted included the strengthening of the ECB, and the monitoring of local authority tariff levels, which the ECB began to do from 1979 informally. Although they did not have the direct authority to do so, they began to consult with local authorities, and would make recommendations for action if necessary to Provincial Administrators. However, even the 'strengthened' ECB only consisted of 7 members (including newly-appointed tariff experts), and a secretariat of 1½ staff. This, and the opacity of local authorities' cost accounting in their electricity undertakings, made effective regulation very difficult (interview with I Lambrechts, ECB member in the 1980s). No notable electricity policy capacity was created in the Department of Industries, and although the ECB's mandate was extended informally, and better resourced, regulation was not placed on an improved institutional footing (6,7).

The questions raised by the BTI, in very limited technical terms, concerning Escom's reserve margin requirements (and thus the requirements and extent of its capital expenditure programme) were brushed aside by government on the advice of Escom. In 1979 the responsible Mininster accepted in parliament that government, rather than Escom, was primarily to blame for the steep nature of the tariff rise (due to the CDF amendment), and stated that

> "..Escom has given me satisfactory proof that the reserve plant margin for future years will not be as high as is believed by the Board of Trade and Industries in its report" (Conradie & Messerschmidt 2000:232).

No significant action was taken as regards local authorities, even though the report had pointed out that local authority tariffs had risen more steeply than Escom's. There were three reasons for

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[27] Numbers in parentheses refer to points on previous page.

this: first, the most effective price pressure came from Escom's customers (energy-intensive industry, rural consumers); second, local authority finances were beyond the scope of the BTI and the Department of Commerce, and in addition were not subject to any form of regulation or monitoring, and thus posed an information problem; and third, they benefited from the strong focus of attention on Escom, which had consigned them to a minor role in the electricity system in the past decades.

Government's reaction to the BTI report was accompanied by several other developments which temporarily restored Escom's external credibility, and its internal determination to resist interference in its expansion programme, which had received a setback in 1977. External pressure was deferred by artificially low price increases from 1979 to 1982. Concerns outside Escom about 'reserve margins' and 'excessive expansion' were overridden by real supply crises in the late 1970s and early 1980s, which lasted sporadically until the late 1980s. These were caused by a number of factors: growth in demand remained high until the mid-1980s, after a temporary dip in 1977; the completion of Koeberg was delayed from the late 1970s until the mid-1980s (and by one more year due to sabotage by ANC guerrillas); Cahora Bassa, which had become integral to the Escom system, was lost due to sabotage in the early 1980s, and lastly, the new generation of giant 'six-pack'[28] power plants experienced significant teething problems, availability was low, and larger reserve margins were required due to the scale of the new plants. Reaction to criticism of the scale of the expansion programme, or to Escom's planning process, was swift and unapologetic.

Escom's position on the expansion programme, which became particularly associated with Jan Smith, who was Escom's general manager during the 1970s and appointed Chairman in 1979, was that it was a programme of crucial national importance, it required bold vision to overcome the temptation to cut back spending in the short term to achieve short-term economic objectives, and that consumers should be prepared to weather the short burst of steep price increases which were necessary to complete the transition to internal financing. In response to tariff increases in 1977, Escom's financial manager Len Te Groen remarked that

> "..you can't have fancy projects like uranium enrichment plants, Sasol II, Richards Bay and Sishen-Saldhana without power. And we can't supply that power without installing expensive new plant ourselves to meet demand. That plant has to be funded and it's our prime function to provide the current the country demands. It's our duty in fact" (quoted in Financial Mail 23/9/77).

The 1979 Annual Report admitted that Escom's constant need to expand, and the long-term planning necessary to take into account long lead times for new plant,

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[28] Consisting of six 600MW generators sets.

"..often leads to public concern over Escom spending, sometimes imagined as being grandiose.." (Escom Annual Report 1979:12).

Smith himself remarked in 1979 in an internal publication that

"..if Escom had acceded to pressures imposed upon it over the past few years to cut expansion programmes in order to avoid raising tariffs to help pay for these programmes, South Africa would by now find itself in a crisis situation not only as far as oil was concerned, but electricity as well" (quoted in Conradie & Messerschmidt 2000:232).

He commented in the 1980 Annual Report that

"..the present constraints on electricity supply can be attributed partly to the cautious economic thinking which emerged in the late 1960s and which was further influenced by the oil crisis in the early 1970s and the recession of the mid-1970s. As a result, Escom complied with a request made in the interests of the national economy to delay certain capital projects.."(Escom Annual Report 1980:11);

and

"..we have lost three to four years of generation expansion as a result of the cautious economic thinking which prevailed in this country during the 1970s..". (Escom Annual Report 1981:10).

This was of course merely a continuation of Escom's view of their core mission, and common to most utilities until the mid-1970s; what is notable about its persistence in the late 1970s was that in other countries, growth rates in electricity demand had fallen off rapidly after the oil crisis due to the link between electricity prices and oil, whereas in South Africa, this had been postponed for around a decade, and the oil crisis had in fact led to an electricity boom of unprecedented proportions. As a result, Escom found itself virtually alone amongst world utilities in significantly expanding its generation capacity, which put it in a very favourable position in negotiating export credits with equipment-manufacturing countries (Steyn 2001:93)[29]. This was boosted by an engineering-based organisational culture, the leadership of which was reared on the 1950s supply crises (Steyn 2001:72). From 1978, other government agencies' projections for electricity demand growth began to diverge from those of Escom, but these concerns were sidelined by Escom's leadership.

The projections of Escom's planning process, based on a constant growth rate higher than GDP (diminishing slightly towards the end of the century), are illustrated In Figure 4.10 below. The red line indicates actual peak demand on Escom's system, plus a 17% reserve margin. The projections between 1974 and 1980 are roughly similar (only the 1974 prediction is shown here).

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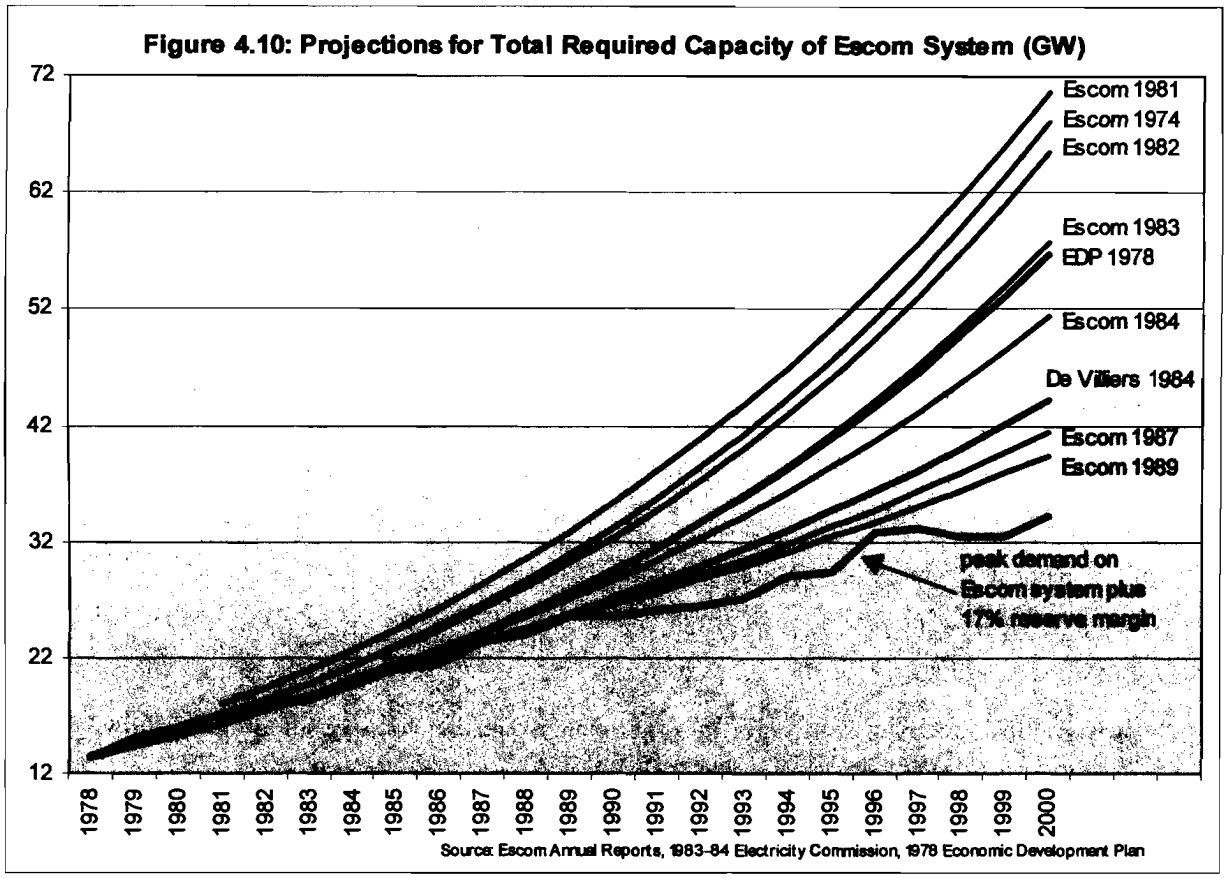
[29] Steyn adds that the South African Reserve Bank provided full forward cover on foreign currency-denominated loans for Escom and other parastatals, which due to a weakening Rand in the 1980s resulted in a loss to the Reserve Bank of R19.1 billion, much of which was attributable to Escom; this constitutes a hidden subsidy in South Africa's current world-beating cheap electricity prices (Steyn 2001:93)



Escom predictions for the total plant required by the end of the 20th century peaked in 1981, and declined rapidly after that to around half that level by 1990. The Department of Planning's Economic Development Plan for 1978-1987 (South Africa 1979a, 1979b) predicted a significantly lower requirement, as did the De Villiers Commission (1984), although both predictions were considerably higher than actual requirements. Politically, the significance of these forecasts is that Escom's forecasts (and its expansion plans) only began to diverge from actual peak demand in the early 1980s. By 1983,

> "Escom was foreseeing a capital expenditure programme of R65 billion, which would treble its capacity to 70 000MW by the end of the century.. ..Escom had generating plant totalling 22 260 MW under construction or on order", which was "equivalent to 97% of its total plant in commission" (Steyn 2001:79-80).

Escom's hermetic planning process was painstakingly defended against state or other interference during this period. Various energy planning exercises undertaken by state agencies provided strong indications that Escom's demand forecasts were wrong; however management chose to stick to their 7% demand growth assumption (Conradie & Messerschmidt 2000:238). In the light of public antagonism, Escom commissioned its own study by outside consultants, which pointed to basic flaws in Escom's projections, based on a halt in investment in new energy-intensive projects after the 1977 price increases: management were advised to cut the expansion programme, but Smith, the Chairman, made a decision not to (Steyn 2001:84).

The scale of the expansion programme was the underlying cause of a second policy crisis in 1983, which was caused by a succession of 'focusing events', including a series of price rises from 1982, when escalating costs forced the abandonment of the deferment strategy adopted in the late 1970s. In addition, power shortages created a strong public perception that Escom appeared to be spending public money on capacity it was not providing (Conradie & Messerschmidt 2000:239). In addition to renewed consumer pressure, resulting from both high prices and the apparent failure of Escom to rein in price increases as soon as the transition to self-financing had been completed, there was a significant change in the alignment of state agencies: the Department of Mineral and Energy Affairs had been created in 1980, and a new set of 'energy bureaucrats' combined with a more activist ECB (which reported to the DMEA's Energy Branch), bolstered the concerns of other state agencies about Escom's autonomy. The accession of PW Botha, and his new market-oriented approach to economic policy, foresaw a transformation of parastatals and their alignment with new government priorities to which Smith's intransigence was an obstacle. Unlike in 1977, the Prime Minister himself took charge of the appointment of a new inquiry.

Escom's management were summoned in early 1983 to the Prime Minister's office to explain the reasons for the 1983 price hike; afterwards he took the unprecedented step of unilaterally announcing a lower price increase, and a week later, he appointed the De Villiers Commission of Inquiry to "inquire into and report on all aspects of the supply of electricity in the Republic of South Africa", with particular reference to the structure of the industry and Escom and the ECB's role specifically, and the

> "..impact of capital formation, price determination, methods of financing and the existing tariff structure on the financial policy of the country with special reference to inflation, economic growth, the creation of infrastructure and decentralisation" (1983-84 Electricity Commission:1-2).

This relatively broad mandate was restricted at its first meeting to "..an in-depth study of Escom's strategy" (1983-84 Electricity Commission:3), which excluded a consideration of the role of the ECB, the distribution industry, and nuclear power[30]; thus the target of the Commission was Escom alone. The composition of the Commission was significant: De Villiers was previously the head of the major Afrikaner mining group, and other commissioners were seconded from the IDC.

The Commission reported the following year, and recommended that:

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[30] The Commission was requested to consider nuclear power as well, and submit its findings confidentially to the Prime Minister (1983-84 Electricity Commission:242). There is no record indicating whether this inquiry took place, but if it did, it was probably negative, since no new nuclear initiatives flowed from the Botha government.

1. A two-tier control structure be introduced, consisting of an Electricity Council of stakeholders to formulate general policy, and a Management Board to run the operational side of the utility.
2. Escom should play a leading role in electricity conservation to maximise efficiency of resource use and minimise capital requirements.
3. Escom should maximise availability of plant, and reassess safety and environmental standards to investigate cost-cutting measures.
4. Escom should change its forecasting techniques, improve consultation with consumers about load growth, and develop more flexible expansion programmes which can be easily expanded or contracted.
5. Abandonment of the 'neither at a profit nor a loss' principle, and the adoption of orthodox accounting principles.
6. Abandonment of the concept of 'undertakings', and a concomitant diversification of cost-reflective tariff structures (1983-84 Electricity Commission:15-18,200-202).

Unlike the BTI inquiry, the Commission framed the inquiry in terms of general energy policy developments since the oil crisis, and identified Escom's planning process as the main problem, which ought to be addressed through institutional reform. The control structure recommended by the Commission consisted of a two-tier system based on the recommendations of a study of nationalised industries in the UK undertaken by the National Economic Development Office, on the basis that institutional models of state-owned enterprises in South Africa are based on UK models (the NEDO recommendations were not implemented in the UK) (1983-84 Electricity Commission:224-226). The Commission outlined an "analysis of the responsibility of the decision-making process required for Escom" in a complicated table, which allots decision-making functions to different parts of government. Notable categories are 'energy policy', 'electricity supply policy', and 'corporate aims and objectives'. For energy policy matters, the Cabinet should decide, the two Escom boards, the Department of Finance, the Economic Advisor to the Prime Minister and the Economic Advisory Council should be consulted, the Minister of Minerals and Energy must agree, and other players should be informed. For electricity policy matters, Escom's Board of Control should decide, the DMEA should be consulted, the Minister of Minerals and Energy should agree, and a few other actors should be informed. For 'corporate aims' related decisions, the management board should decide, the control board should agree, and large customers should be informed (1983-84 Electricity Commission:232). The other major policy change that the Commission recommended was that Escom play a significant role in energy saving, noting that

> "South Africa's future opportunities and challenges.. ..under the present world economic conditions, depend on the success it achieves with an energy saving policy which, in accordance with the broad OECD guidelines, must be tackled with vision and drive.. ..although Escom was in the past mainly geared for the provision of an abundant supply of cheap electricity, and cheap electricity encouraged excessive consumption, Escom will in future have to play almost the opposite role as *its policy for the saving of electricity by consumers must be designed to serve the national interest*" (1983-84 Electricity Commission:237).

In fact, electricity conservation or efficiency programmes were not seriously undertaken by either Escom or the DMEA; when Escom started to experience over-capacity in the early 1990s, it began to actively explore new energy-intensive projects with the IDC. Government's response to the Commission's recommendation was to accept with some modifications the main recommendations on governance and institutional reform, which were partly promulgated in 1985 and 1986 amendments to the Electricity Act. The Electricity Council was given such wide powers to set policy that the drafters thought it prudent to include a clause (3(1)3), which states that

> "..the Minister may from time to time reserve matters, including matters relating to the formulation of a national policy in connection with the generating and supply of electricity in the Republic, in respect of which the Electricity Council shall consult with the Minister before taking a decision in the matter" (Electricity Amendment Act 50/1985).

The 1986 amendment abolished the pricing principle of 'neither at a profit nor a loss', and replaced this with a procedure which set the prices in 1986 at the old level; any subsequent increases by Escom would then be published in the Government Gazette and local media, and objections would be heard by the Electricity Control Board and adjudicated on; in addition Escom no longer required its operations to be licensed (Clause 16, Electricity Amendment Act 54/1986). In practice, Escom price increases from 1983 were approved by the relevant Minister on an annual basis.

In 1987 two new pieces of legislation, the Electricity Act (41/1987) and the Eskom Act (40/1987), consolidated and entrenched the new institutional structure of the industry, and formed the Commission into an entity called 'Eskom', a combination of the English Escom and the Afrikaans Evkom. The function of Eskom was "to provide the system by which the electricity needs of the consumer may be satisfied in the most cost-effective manner" (Clause 3, Eskom Act 40/1987). The Act also gave Eskom leeway to set prices as it saw fit, subject only to an appeal process (adjudicated by the ECB) in cases where tariff structures were altered (Clause 15, Eskom Act 40/1987); apparently Eskom's legal department played a "major role" in drafting the amendments and legislation, and were responsible (contra De Villiers) for removing

themselves from regulatory oversight (Steyn 2001: 104). Clause 24 stipulated that (since Eskom would now conceivably make a profit) Eskom was exempt from any tax or dividend payment to the state. The significance of these changes was that the Electricity Council was effectively given the role of making electricity policy; in addition, Eskom was accountable to government through the Minister of Public Enterprise rather than the energy line function. In 1987 the two portfolios shared the same Minister; in 1990 Eskom was effectively removed from government's energy function and placed in a separate department, the Office of Public Enterprise, which removed it from the institutional context of energy policy into what was effectively a different policy domain, focused on commercialising and privatising state enterprises. While the outcome of the Commission resulted in a higher level of integration of electricity policy into other industrial and economic policy domains, it weakened its integration into the energy policy domain.

The immediate practical outcome for Escom of the Inquiry was the replacement of Smith with a new leadership. Johan Maree was appointed to run the Council, and Ian McRae was appointed as CEO. Maree was chosen because of his background in finance rather than electricity or energy (Davis 1997:138), and proceeded to transform the engineering-dominated management culture to a more commercially-oriented one. Changes in management and accounting practice, with other important factors such as the scaling back of investment and low capital requirements (because of overinvestment), led to a significant improvement in Eskom's finances during the 1990s (Davis 1997:143). Maree's background was as a senior figure in the new Afrikaner business elite, who had been seconded from the private-sector Barlow Rand industrial group in 1979 at P.W. Botha's request to place the state arms manufacturer Armscor on a commercial footing, and it was expected that he would do the same in Escom (he did), and later in the Atomic Energy Corporation (with less success). Botha's programme for parastatals included, where feasible, privatisation[31] (without market reform – Conradie & Messerschmidt 2000:261), which was enthusiastically advocated by Maree and Eskom's senior management, but contested by the Electricity Council and large consumers (Conradie & Messerschmidt 2000:262-263). The exit of P.W. Botha from the presidency and his replacement by F.W. De Klerk, as well as the opening of secret negotiations with the ANC at this time, led to the proposal being shelved (Eberhard 2003:7).

By the end of the 1980s, Escom had lost its ability to make unilateral planning and price decisions, and Eskom's new leadership appraised the main challenge as how to "keep government out of the engine room" (Interview with I McRae), which involved two immediate strategies: the first involved a process of credible 'benchmarking' against other utilities

[31] The Botha-appointed De Villiers Commission also contained prominently in its terms of reference a directive to explore the potential role of the private sector in electricity supply in South Africa, but the Commission chose to confine itself to "an in-depth study of Escom's strategy" (1983-84 Electricity Commission:1,3).

internationally, and the other consisted of a 1991 'price compact' between Escom and the relevant line Minister, involving a 9% price increase in 1991, followed by a commitment to reduce prices by a cumulative 20% over five years (Davis 1997:166, Conradie & Messerschmidt 2000:281). Eskom's official history records this compact as

> "a brilliant stroke that was to keep the government out of the price increase debate – the engine room – on a detail level for at least five years" (Conradie & Messerschmidt 2000:281).

Since the transitional process had been set in motion, a greater challenge was to keep the government-in-waiting out of the engine room, which was the basis for much of Eskom's involvement in the transitional electricity policy process.

3) 1980s to 2004

From an electricity policy point of view, the main feature of the transitional period was the changed context for electricity policy: whereas since the 1960s, electricity policy had been narrowly focused on Escom and the electricity supply system and largely excluded local authorities, from the early 1990s electricity policy debates were widened to include the entire electricity system. The key policy issue became electrification, and supply issues disappeared from the agenda, partly because by the early 1990s Eskom had significant over-capacity, and no new decisions were required in terms of generating capacity until well into the next decade. Electrification gave rise to three other significant developments: the first was a concern with significant institutional reform, the outcome of which was the establishment of an independent regulatory with significant powers; the second was the inauguration of an industry restructuring process, which ended in a stalemate a decade later, and the third was a renewed attempt to place electricity policy in a broader energy policy context, which began at the household level, and was extrapolated to the energy system in general, and culminated in an Energy Policy White Paper.

However, the fragile policy coalition which underpinned the commitment to the process of institutional reform was based on the requirements of the electrification programme; ironically, the coalition disintegrated with the success of the programme, and political support for institutional reform waned, abetted by opposition to restructuring from key constituencies, including Eskom and local authorities. By the end of the period, the structure of the electricity policy environment resembled a modified form of its pre-transition structure, with some notable differences, including a significantly-altered distribution industry, a relatively strong regulator with the institutional authority to set prices, and a newly-developed electricity policy capacity in

government; however, despite this, planning for electricity supply reverted to Eskom, and occurs outside of a broad energy policy framework.

Electrification and the National Electrification Forum

As described above, the development of the South African electricity distribution sector was fundamentally influenced by apartheid; the remarkable lack of electricity infrastructure in areas designated 'black', even in large urban centres, was exacerbated by apartheid spatial and political developments during the 1970s and 1980s. In the 1970s, significant areas of the country were separated off into 'homelands' with separate electricity distribution organisations; in the 1980s, the three most significant developments were the attempt to establish Black Local Authorities in terms of the 1982 Black Local Authorities Act to govern 'black' urban areas, the establishment of racially-distinct local authorities for 'coloureds' and 'indians' in terms of the tricameral parliament (Cameron 1995:403), and the establishment of a regional superstructure for distribution bulk services to all racially-zoned areas within a specific metropolitan area, the so-called 'Regional Services Councils' in terms of the 1985 Regional Services Council Act (Christopher 1994:53-55).

The RSCs represented local authorities in proportion to their revenue bases, which meant that even though they 'represented' all racially-based authorities within a particular area, they were dominated and controlled by 'white' local authorities (Christopher 1994:55). The reason for their establishment was to transfer resources to Black Local Authorities as part of Botha's Total Strategy, which aimed through selective 'upgrading' of black townships to defuse what by then was an outright insurrection (Cameron 1995:405). Black Local Authorities were politically a failure, with a turnout of only 7% of potential voters in their first elections in 1983 (Christopher 1994:55), and were also circumscribed severely in the scope of their activities by virtue of their control by the responsible (white) Minister, who could direct them to make by-laws, sack councillors, and prescribe service charges (Cameron 1995:407,409). The Minister did this on numerous occasions, further undermining the legitimacy of the BLAs and leading to widespread payment boycotts by residents, which further undermined the ability of BLAs to function effectively.

White local authorities on the other hand benefited in a number of ways from their dominant position. Those BLAs which did implement limited electrification schemes were severely disadvantaged not only by lack of infrastructure and finance, but also by the resulting poor load profile, which being based almost solely on poor residential users, made their bulk supplies much more expensive and their systems much more problematic to manage; in 1989, for instance, white local authorities supplied 91% of all commercial and industrial consumers,

whereas BLAs supplied only 1% (Horwitz 1994:9)[32], which effectively provided a significant subsidy to white authorities. Another disparity involved the bulk supply of electricity by white local authorities to BLAs, which was usually done on an industrial tariff containing a significant surplus component, which was then transferred to the white authority's general rates account (Horwitz 1994:9). It was common practice for white local authorities to generate income from water and electricity sales; a 1978 survey revealed that while rates provided 16.3% of current revenue of white local authorities, surpluses such on services such as water and electricity provided 55.9% of revenue (Cameron 1995:398). In 1989 40% of revenue of white local authorities was derived from electricity surpluses (Horwitz 1994:8). This was (and is[33]) in effect a way of keeping rates down, and since most electricity revenue is derived from industrial users, it constituted a subsidy on residential rates; thus ironically,

> "..in many situations electrified black townships subsidise their nearby white municipal provider" (Horwitz 1994:9).

By the end of the 1980s almost all BLAs were in crisis and a host of problems, including incompetence, financial mismanagement, payment boycotts, bulk disconnections, technical problems (including huge unaccounted electricity losses) and an overwhelming lack of political legitimacy, meant that electricity distribution was in crisis. The same problems applied to rural distributors in the 'homelands' and 'independent states'. These problems applied to areas where there was basic distribution infrastructure; however, mostly there was not: by comparison to other countries with similar income levels (Greece – 100%, Argentina – 88%, Venezuela – 86%, Costa Rica – 85%, Thailand – 75%, Brazil – 65%), electrification rates for domestic households in South Africa were extremely low (35%) (Eberhard & Van Horen 1995:48)

The disparity is very striking, and neither is the disparity due to income distribution, since Brazil and South Africa had at the time and still have very close Gini Coefficient values. There is some debate concerning the level of electrification in 1990. Early estimates range from 30-40% (Dingley 1987, 1990; Eberhard & Van Horen 1995) of the population having access to electricity; a figure derived from the NER connection rates for 1991 to 1994 and audited electrified households from 1995 onwards indicates a figure of around 43% of households were electrified. However, due to the increase in household membership from wealthy to poor households, it is likely that this figure represents significantly less than 43% of the population; it is thus likely that only around 35% of South Africans had access to electricity in 1990. In addition to a lack of access to electricity, those black South African households which were

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[32] This reflects the *number* of consumers, not the quantity of electricity sold; black local authorities would almost certainly have supplied less than 1% of the electricity to these consumer classes.

[33] This is still a contentious issue in the ongoing debate about the restructuring of the electricity distribution industry; although local authority tariffs are now subject to regulation, significant surpluses have not been ruled out.

connected to the grid suffered from erratic services and on occasions bulk disconnections (Horwitz 1994:9), and other effects stemming from incompetent and often corrupt management of local distributors. As a result, the majority of South African households in urban and rural areas depended on non-electric energy sources for heating, cooking and other energy services. In practice, this involved a range of fuels such as coal[34], paraffin and various forms of biomass, which posed serious health and safety problems, as well as imposing various other costs such as labour time to collect firewood. The apartheid government made a much-publicised and not very successful attempt to electrify Soweto in the 1980s, but other than this, electrification of black households proceeded haphazardly, or was avoided on the basis that it was not 'economical'.

From a policy and a conceptual point of view it is useful to draw a clear distinction between an interest in electrification by various actors, the involvement of organisations such as Eskom and local authorities in electrification projects in the late 1980s and early 1990s, and the 'national accelerated electrification programme' which was an outcome of a negotiation process from 1992 to 1994; a definitive decision was taken in 1994, and the parameters of the programme were delineated in the ANC's Reconstruction and Development Programme, published in that year.

The key actors in the electrification decision-making process leading up to 1994 were Eskom on the one hand, and a group of 'energy policy activists' ('policy entrepeneurs' in Kingdon's terms) associated both with the ANC's Minerals and Energy Group (MEG – the ANC's minerals and energy policy forum), and with the Energy and Development Research Centre (EDRC), a university-based research group focused on energy poverty issues. Because the DMEA had no standing institutionally, and was initially prevented by their Minister from participating in the process, the state's energy bureaucracy was marginalised and did not play a significant role in the initial process. Traditionally, electrification was regarded by the DMEA as outside the scope of electricity policy (which for them meant only electricity supply), and solely within the jurisdiction of local authorities; similarly, energy poverty as an energy policy problem was equally foreign to the state energy bureaucracy during the 1980s (Interview with J Basson). In addition, the DMEA and its temporary successor, the NEC, had no real jurisdiction over electricity policy: for instance the 1986 White Paper on Energy Policy contained an electricity policy section which was merely a restatement of the conclusions of the De Villiers Commission. Research funding by the NEC began to create a space for investigating household energy issues from the end of the 1980s, but no concrete policies resulted from this.

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[34] Coal is used in poor households in South Africa mostly in locations where it is cheaply and easily available, i.e. in the coal-producing areas, but paraffin, wood and LPG tend to be used in areas further away due to the cost of transporting it.

The development of electrification policy proposals by ANC-aligned energy policy activists was the result of a confluence of two related lines of policy research which merged in 1991 at the University of Cape Town. The first developed from an initial focus on energy use by poor rural households to a more general focus on energy poverty, and began with the formation of the Centre for Research into Appropriate Energy Technology (CRAET), later renamed the Energy and Development Research Centre (EDRC)[35] by its Director, Anton Eberhard. The EDRC focused on two areas : 1) energy demand by poor rural households, which was unresearched in South Africa at that point, and 2) small-scale non-grid technologies (including efficient wood stoves, photovoltaic systems, water pumps etc) for rural applications. The EDRC was an outcome of a peculiar match: it was staffed by energy policy researchers who were broadly sympathetic to the anti-apartheid movement, and in many cases actively involved in it, but was funded by the state, via the NEC. This was possible because the NEC was situated outside the orthodox civil service, and contained a large number of research personnel in decision-making positions recruited from the state scientific research organisation (the CSIR). Moreover, 'energy for development' was portrayed as a relatively apolitical area of research, since it applied to a set of problems which were located in a policy vacuum at the time.

The second line of research was done in an electrical engineering context, primarily by Charles Dingley at the University of Cape Town, who began research on electrification from a supply-side point of view in the mid-1980s, funded by Eskom, the NPER and later the NEC. Dingley also worked with the Association of Municipal Electrical Undertakings (AMEU), an influential technically-orientated organisation of municipal electrical engineers. In a 1987 paper presented to the SAIEE he proposed for the first time the establishment of a national electrification programme run by a 'national electrification commission', since

> "..to impose upon Eskom the responsibility for a national electrification programme would create an organisation with two widely divergent roles" (Dingley 1987:7),

and attempted to spell out what the implications for such a programme would be technically, financially and institutionally. In a 1990 paper published by UCT's Department of Electrical Engineering, Dingley laid out the parameters for a 'national electrification programme' (Dingley 1990:10). He also raised the question of financing, which was one of the central dilemmas to be solved. There were two important questions: the first was whether potential consumers could pay for the capital costs of connection; and the second was whether electricity use levels would cover distribution costs. Dingley's work was linked in important ways to the demand-side work being

[35] Between these, it was named the Energy for Development Research Centre.

done in the EDRC[36], and both lines were united in a ground-breaking graduate thesis on urban electrification by Theron (Theron 1991), supervised jointly by Dingley and Eberhard. This synthesis had two outcomes. First, it placed the concept of electrification into a broader energy policy context based on a demand-side approach to energy poverty, which, secondly, placed the energy poverty question, which had previously been posed primarily in relation to rural energy issues (which required a 'development' response) into a political context, in that it posed significant challenges to existing institutions and resource allocation patterns.

Electricity policy in the 1980s, established by the Borckenhagen Committee in the 1960s, and forcefully re-emphasised by the De Villiers Commission, was that Eskom should confine itself to generation and transmission activities only. To this end, Eskom had been disposing of distribution assets in 1985 and 1986, and only distributed to large users and white farmers directly. In 1987, Eskom only had 270 000 customers, 100 000 of which were farmers, and the rest mining and industrial customers (Interview with A Morgan, Eskom CEO from 1994 to 2000). In the late 1980s, Eskom's leadership made a decision to unilaterally reverse this policy, and to involve the utility in the distribution industry; thus, by 2002, Eskom had 3 447 834 customers, of which 3 297 379 were households (National Electricity Regulator 2002), only slightly less than the total number of customers supplied by all local authorities combined. This fundamental change in policy solved the institutional problem outlined by Dingley and others, and established the potential that Eskom be the key agency in a national electrification programme.

The way in which Eskom involved itself in the distribution industry was via the takeover of existing electricity systems administered by Black Local Authorities, which were generally in a state of chaos (see above). The initial impetus to get involved in electricity distribution in these areas was because of a growing bulk debt crisis in the late 1980s, whereby BLAs, because of non-payment (partly the result of a politically-motivated boycott), corruption and mismanagement, were unable to pay Eskom for their bulk electricity supplies. After exploring various alternatives, Eskom negotiated with the (apartheid-era) local authorities of Soweto and Johannesburg (Conradie & Messerschmidt 2000:276) to take over the Soweto electricity supply, which ended in a stalemate. In the late 1980s, Eskom took the unusual step (for a state corporation) of negotiating with (anti-apartheid) grassroots community organisations instead, for which it came under severe pressure from the apartheid security establishment (Conradie & Messerschmidt 2000:277). In the early 1990s, Eskom successfully used its leverage with bankrupt local authorities which owed huge sums to Eskom for bulk electricity supplies to

[36] In an interview, Dingley stated that Eberhard's work on energy demand in poor households had for the first time provided a framework for the problem of energy poverty in South Africa; this formed a basis for his initial work on electrification.

conclude transactions whereby the debt would be written off in exchange for Eskom taking over electricity distribution in the authority's area of jurisdiction. In 1992 Eskom finally took over electricity supply in Soweto, as well as in 38 other local authorities on a similar basis, and eventually took over distribution networks in 130 townships (Conradie & Messerschmidt 2000:280). Later, a National Electrification Forum recommendation to Cabinet in 1994 that Eskom take over the utilities of the formerly 'independent' states was approved; thus, by 1994, Eskom had distribution rights in both urban and rural areas where the majority of unelectrified households were located, which formed the basis for Eskom's dominant role in the programme.

After a few trial projects in the late 1980s, Eskom began to undertake electrification on a large scale, which caused considerable tension between the CEO and the management team, and the Electricity Council, for both political and financial reasons. Politically, Maree and the Council were far less keen to move ahead of the apartheid government, whereas McRae was keen to engage with the unfolding political and social reality, as described by an Eskom engineer:

> "What was happening was that McRae was opening up some space internally in the organisation, but at the level of Council it was a very firmly Nat[37] thing, and they were not going to move ahead of the Nats, and so there was this constant tension between those two men.." (Interview with M Pickering).

Initial electrification rates were low, due to stringent financial criteria imposed by management, but these were gradually removed. There were two related motivations for Eskom's increasing involvement in electrification, both of which were closely associated with Eskom's CEO, Ian McRae. The first was a strategic motivation, which McRae also found instrumental in persuading the more recalcitrant elements on the Electricity Council to commit the organisation to electrification:

> "..one of the threats [of the transitional process] was the government 'nationalising' Eskom, moving not only to ownership, but to severe control, particularly because of the possibility of a change of government at that time.. ..I needed to get an answer; the question was when, not if, the ANC came into power; would they in fact want to take control of Eskom, in addition to being the owner; I was getting this question from all over the organisation .. ..I managed to get a lunch with [Mandela] and Thabo [Mbeki][38], and I put that very question on the table to them, and quickly Thabo said no, he thought Eskom was doing a good job; we were busy with electrification, and were busy with what we called an equal opportunities programme at that time.. ..Mandela came in; he agree with Thabo, but what he wanted to say to me was that it didn't matter who the government was; if the people put pressure on the government, then

[37] 'Nat' = National Party, the apartheid-era ruling party.
[38] Mbeki would shortly become Vice-President in the new government, before becoming President in 1999.

in fact the government would have to take action.. ..that was exactly what my concern the year before had been" (Interview with I McRae).

What is notable about this lengthy passage is, again, the easy familiarity that Eskom's leadership had with both the old and the new political elite, as well as the importance for Eskom of establishing new ground rules in the transition as soon as possible. The second motivation began as a personal conviction shared by Eskom's leadership concerning the social necessity of electrification as a partial antidote to years of apartheid-inspired oppression and neglect in black communities, experienced personally by senior management when they visited areas in which Eskom had taken over distribution systems:

> "What was initially a financial imperative turned to a social imperative, and guys like Ian McRae and others, and I was amongst that team, went into these areas, and what we saw was just damn well shocking, and that's when the whole concept of electrification for all came about, that we needed then as an organisation to get involved, and I often referred to this as the years when Eskom found its moral purpose.. ..this was something that gave meaning to the organisation in terms of really serving communities" (Interview with A Morgan, Eskom CEO 1994-2000).

This was translated into the corporate slogan: 'electricity for all' in the late 1980s. A large-scale electrification programme would rest on three things: institutional authority, political legitimacy, and technical and financial capacity. These were co-ordinated through a negotiating process which began with a conference organised by researchers from the EDRC under the auspices of the ANC in Cape Town in 1992, which was the beginning of a process of synthesis between Eskom's and the government-in-waiting's electrification policies. Many researchers linked to the EDRC were also involved in the ANC's newly-established policymaking structures, including its Science and Technology Working Group and its Minerals and Energy Group.

The decision to hold the conference under the banner of the ANC was a deliberate political move to place electrification on the policy agenda in the context of the transition (Interview with A Eberhard). The Conference was remarkably successful in bringing together a wide range of actors in the electricity industry, including representatives from the ANC, the South African Communist Party, the Democratic Party, civic organisations[39], trade unions, development-focused NGOs, local authorities, the AMEU, and Eskom (Theron 1992:209). Government denied permission to DMEA officials to attend (there was thus no government representation), and also attempted to prevent Eskom from attending. Eskom themselves were very wary; however they attended unofficially (Interviews with senior DMEA officials). The most important outcome of

[39] Civic organisations in 1992 were community-based anti-apartheid organisations, which were loosely organised into a national anti-apartheid alliance called the United Democratic Front, which was disbanded shortly after the unbanning of the ANC, which filled its place politically but not structurally.

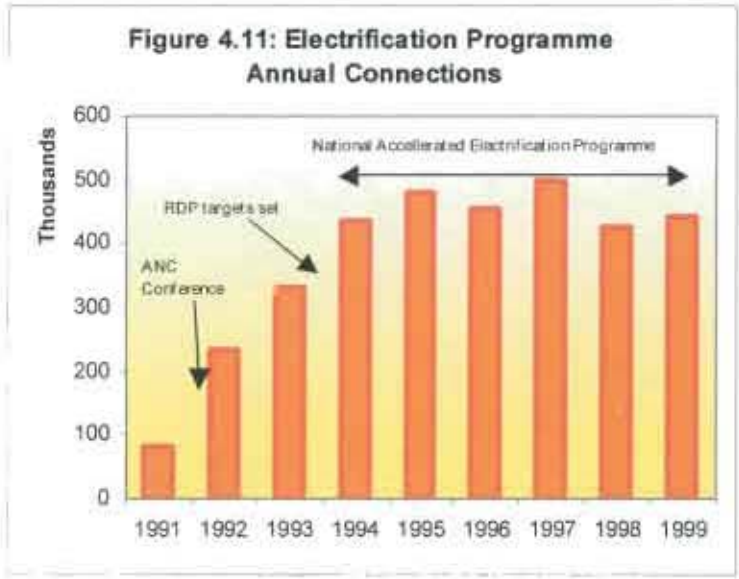
the Conference was an informal agreement to establish a National Electrification Forum (NELF); Eskom's leadership was persuaded from the Conference to commit themselves to participate (Interview with A Eberhard).

The core of NELF was a management committee consisting of representatives of the AMEU, the ANC, the Chamber of Mines, the DMEA, Eskom, the National Union of Mineworkers and the National Union of Metalworkers of South Africa (the two ANC-aligned unions who had strong presences in Eskom), the South Africa Agricultural Union and local authorities via the United Municipal Executive. The concrete work in NELF was done by eight working groups focusing on regulatory structure and policy; human resources; supply technology and standards; data on electrification levels and needs; finance and tariffs; transitional issues; end-use and environment, including appliances and environmental issues; and a management working group to integrate the other processes (National Electrification Forum 1993:3). These groups addressed a multitude of financial, technical and institutional challenges to a large-scale electrification programme, including technical innovation, problems in electrifying informal settlements, large-scale debt, and financing options.

There were two primary outcomes from NELF. The first was a consensus that an 'accelerated national electrification programme', on a much larger scale than Eskom's planned programme, was necessary. The final details of the programme were agreed between Eskom and ANC-aligned energy policy activists in 1994, and written into the energy policy section of the ANC's Reconstruction and Development Programme 'base document', the ANC's general social and economic policy framework:

> "An accelerated and sustainable electrification programme must provide access to electricity for an additional 2.5 million households by the year 2000, thereby increasing the level of access to electricity to about 72 per cent of all households (double the present number). Both grid and non-grid power sources (such as solar cells and generators) must be employed. All schools and clinics must be electrified as soon as possible. Communities must be involved in the planning and execution of this programme. Micro, small and medium-sized enterprises must be given support and shown preference in the tendering process" (ANC 1994b:section 2.7.7).

The next point provided precise costs and financing directives for the project, which would be around R12 billion, which should be "..financed from within the industry as far as possible via cross-subsidies from other electricity consumers" (ANC 1994b:Section 2.7.8). The scope of the programme, numerically and financially, was derived from EDRC policy research, which outlined the maximum feasible size of the programme in financial terms. Figure 4.11 below portrays the annual connection rate of the electrification programme: the EDRC studies were



critical in establishing the feasibility of a much higher connection rate, and the programme was sustained at the higher level for the following five years.

The second outcome from NELF was a consensus that a process of institutional reform needed to be undertaken in the electricity industry generally. There were two primary drivers for this consensus: the first was that apartheid-era institutions needed to be transformed, and rendered more accountable to the society generally; and the second was that existing institutional arrangements were inadequate for the electrification programme to be carried out successfully, particularly in the distribution sector. This set in motion a complex process of institutional reform, which will be discussed below.

Institutional problems with the implementation of the electrification programme were solved in a piecemeal fashion, with a prominent role being played by the newly-formed independent regulator, the National Electricity Regulator. The first problem which needed to be addressed was the relationship between Eskom and local authorities, which still controlled large urban areas where electrification was required. It was thus necessary to divide the 2.5 million between Eskom and local authorities, which Eskom did by setting its own target of 60% of the total.

The programme was conceived in two phases. The first lasted until 1999, when the aim was to electrify the target 2.5 million households, and the second open-ended phase, from 2000 onwards, at a lower rate of around 250 000 households per year, aims to electrify around 80% of all households by 2010, which includes a small proportion of households which are not economical to connect to the grid being provided with solar PV systems. The capital cost of the connection was and is subsidised, which entails a cost of around R1 billion per annum. During the first phase of the programme, the capital cost for the entire programme was covered by Eskom, via an agreement with local authorities, where funds for local authority electrification projects were transferred from Eskom to local authorities via an auditing process managed by the NER. After the corporatisation of Eskom in 2001, when the utility began to pay tax and dividends, electrification was funded directly from the fiscus through the DME, and co-ordination of the programme was shifted from Eskom and the NER to a National Electrification Co-ordinating Committee established in 2001, consisting of Eskom, the NER, relevant

government departments, funders and the South African Local Government Association, based in the DME. In 2001, 66% of the households in the country were electrified (National Electricity Regulator 2001). According to the 2001 Census, 70% of households used electricity for lighting, but only around 50% used electricity for heating and cooking (Statistics South Africa 2001); thus many households are still dependent on unsafe and unhealthy fuels such as paraffin[40]. As a result, government is considering introducing free basic electricity of 50kWh per month, to encourage higher use of electricity, in the absence of an integrated household energy strategy.

Institutional Reform and Restructuring

As mentioned above, one of the outcomes of the NELF was a commitment to institutional reform. The actual form this would take, however, was unclear – there were three levels of consensus within the forum. First, there was a high level of consensus that a powerful independent regulator be established, to regulate all aspects of the electricity system, which was supported by both Eskom, who supported an independent regulator as a guarantee against politically-influenced price setting, and a development supported by international trends, and by ANC-aligned delegates and unions, who saw a regulator as a counter-weight to Eskom's domination of the electricity industry (Interview with A Eberhard). As an interim measure, Eskom had in 1994 concluded a second 'compact' with the new government, which was negotiated partly with the ANC in the run-up to the elections (in a correct anticipation of an ANC victory), and partly in terms of a requirement of the new government that parastatals produce a list of ten 'RDP commitments' (Conradie & Messerschmidt 2000:325). Eskom's 1994 'compact', in addition to another price compact (reducing the real price of electricity by 15%) involved achieving a new set of goals involving electrification (the Eskom share of the 2.5 million households), affirmative action ("50% of management, professional and supervisory staff should be black South Africans"), training and skills development, contributing financially to the electrification of schools and clinics, and protecting the environment by the year 2000 (Davis 1997:167). This compact provided a degree of stability for a window period of around five years, while the new regulator established itself.

Second, there was more limited consensus on the need to restructure the distribution industry, both to overcome the legacy of apartheid, as well as for practical reasons related to the electrification programme. There was, however less consensus on which form the industry should take; this was a question which was deferred to the NER. Third, there was no consensus

[40] The discrepancy between the census data and the NER data is not easy to explain: census data is gathered by door-to-door surveys, whereas the NER data is from audited figures for electrification nationally, which is then used to calculate percentages of electrified households based on census data. Other more detailed studies (but more limited in scope) indicate that it is likely that of the 50% of households which use electricity for cooking, many of these only use it occasionally, and use other energy carriers as well.

on the question of restructuring the electricity supply industry; although this was not extensively discussed, there was a division between unions, who advocated an integrated state-owned utility, and other ANC energy policy activists, who were in favour of market reform, and the introduction of competition. This debate was also deferred.

Government accepted NELF's recommendation to establish a regulator in October 1994 (Eberhard 2003:24). The new regulator was envisioned by NELF as performing not only a licensing and economic regulation function, but also the role of an 'honest broker' in the energy system, as outlined in the ANC's RDP document:

> "..a powerful, independent, national electricity regulator must be established to enforce public policy, ensure long-term financial viability, assure environmental sustainability, and act as an ombudsman in the event of conflicts between consumers, government and the electricity industry." (African National Congress 1994b:Section 2.7.10).

The establishment of the NER involved a complicated institutional transformation. The new powers of the NER, which would include licensing all aspects of the electricity industry, including those of local authorities, would in effect take over a collection of functions performed formally and informally by the ECB, Eskom's Electricity Council and Provincial Administrators[41], as well as line ministries, which post-1985 effectively had a power of veto on Eskom's tariff increases. There were, for example, several members of the Electricity Council who were also members of the ECB; this was not regarded as a conflict of interest under the post-1987 governance system (Interview with I Lambrechts). However, while this apartheid-era regulatory regime depended largely on an extended and uniform policy network within the apartheid establishment (which included the new leadership of Eskom), the political transition required the new Regulator to have a high degree of independence in order to achieve legitimacy with both the electricity industry and the new government. The regulator was established by amending the 1987 Electricity Act and renaming the Electricity Control Board the National Electricity Regulator. In terms of the amendments, *all* electricity undertakings, including those of Eskom and of local authorities, required a licence (Clause 5, Electricity Amendment Act 46/1994), and were thus subject to price regulation. The 1995 amendment provides for the independent funding of the NER through a 'licence fee' paid as a levy on electricity "generated for supply by any licencee concerned during the year concerned" (Clause 5B(3)(c), Electricity Amendment Act 60/1995). NELF was disbanded in February 1995, and the NER was established in April 1995, with a staff complement largely comprised of ex-Eskom personnel, and headed by Ian McRae, the retired Eskom CEO.

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[41] Provincial Administrators were in any case done away with after 1994; a new provincial structure was introduced with elected provincial governments.

The regulator played three distinct roles over the next ten years; the first was to form a focus for the restructuring process in the industry; the second was to oversee the electrification programme, and the third was to fulfil the orthodox functions of an economic regulator. The key role of the NER as a facilitator in the electrification programme and the restructuring process declined as the new government developed policy capacity in these areas, towards the end of the 1990s. The NER initially played a key co-ordinating role in the electrification programme, between Eskom and local authorities; the overall co-ordination of the programme was later moved to the DME, but the NER still plays a pivotal role in auditing electrification projects for the purposes of funding the programme. The NER also took over the role, previously performed by Eskom, of collecting data on the electricity industry as a whole. The NER's role as a facilitator in the restructuring processes can be divided into a broad role relating to the structure of the industry, and a narrower more technical role relating to the pricing structure of the industry. The former role has declined as the post-apartheid government's policy capacity has increased in the DME and the Department of Public Enterprises; however the latter role is crucial as local authority tariffs are restructured, as well as the wholesale pricing system, as a prelude to market reform. Although a new wholesale pricing system has been introduced, market reform has been postponed indefinitely.

State interest in restructuring the distribution industry began slightly before the transition, when the Minister of Mineral and Energy Affairs requested the NEC to undertake an investigation of the EDI in February 1991, which unsurprisingly

> "..confirmed that a fragmented organisational structure had developed which had led to poor quality and expensive services in certain cases, a lack of specialisation and economics of scale in others, and a multiplicity of policies and tariff structures.." (National Energy Council Annual Report 1992:26).

Unfortunately, one of the main underlying problems in the industry was apartheid itself, which could not be addressed in this context; the NEC's concerns were superseded by the negotiation processes in NELF. There was some tension in NELF concerning its actual mandate, and whether the 'E' stood for electricity or electrification (Interview with A Eberhard). Although NELF failed to devise a comprehensive restructuring policy, two significant things were achieved. The first was the establishment of the NER, one of the aims of which was to play a significant role in facilitating and monitoring the restructuring process, and the other was the overseeing of Eskom's absorption of the remaining dysfunctional local authority and 'independent state'/'self-governing territory' distributors. Aside from comprising an important form of rationalisation (given the dysfunctionality of these distributors), these areas represented the least electrified areas in the country, which made their absorption by Eskom strategically

important for the electrification programme. According to NELF reports, in TBVC states only 8% of households were electrified, and in 'self-governing territories' only 17% of households were electrified (National Electrification Forum 1993:2). During this period, Eskom put forward its own distribution industry restructuring proposal, which was based originally on a model developed in 1988 at a workshop organised by Eskom's distribution division, related to electrification specifically as well as broader structural issues, particularly the complex and irrational structure of electricity tariffs operating in different distributors. In 1992, Eskom restructured their distribution operation into six regions, which was conceived and proposed as a general model for the whole country's distribution industry (possibly as a separate entity from Eskom), partly in order to solve the bulk debt problem faced by many local authorities. Consultants were contracted to examine ways in which local authorities could retain their surpluses, where these existed, but the proposal was rejected by local authorities in 1993 (Interview with A Morgan; Conradie & Messerschmidt 2000:312-313).

Immediately following its formation, the NER established the Electricity Working Group (EWG), consisting of representatives from the NER, government, local authorities and Eskom, but excluding other stakeholders such as unions or civic organisations (Eberhard 2003:30). The EWG reported both to the Minister of Minerals and Energy, as well as to the Minister of Provincial Affairs and Constitutional Development (which at the time dealt with local government), and made recommendations to Cabinet, which set up an internal government committee, the Electricity Restructuring Interdepartmental Committee (ERIC) (1998 Energy Policy White Paper:30). In 1997, Cabinet approved this committee's recommendations, which were to restructure the EDI into 'the maximum number of financially viable Regional Electricity Distributors (REDs)' (Eberhard 2003:31).

Estimates for this number varied significantly between five and nine. After further investigations, Cabinet approved the transitional process between 1998 and 2001, which involved demarcating six Regional Electricity Distributors (REDs), and creating a holding company as a transitional measure (Eberhard 2003:31). Implementation of the restructuring process has, for several reasons, stalled; part of the reason for this is that large local authorities derive a considerable surplus from electricity sales, which amounted in total in 1997 to R2 billion (Barbeton & Keswell 1998:42), or around 5.5% of total local authority revenue (Barbeton & Keswell 1998:46). However this revenue is not evenly distributed; a few small authorities make massive surpluses on electricity trading; the top four surpluses (in absolute terms) are generated by local authorities which distribute 40% of the electricity of local authorities but generate 50% of the surplus, and 99 municipalities (25% of local authority distributors) lose money on electricity distribution, and would gain from the removal of their distribution assets

(Barbeton & Keswell 1998:46). In addition to this, local authorities were restructured in 2000, which reduced their number, and removed much of the fragmentation which had resulted from apartheid. Whereas during the transition the legitimacy of local authorities was weak, and there was a lack of national co-ordination between them on policy matters as a result of apartheid divisions, the new generation of local authorities have been able to form a coalition with other state agencies, notably the Treasury, to protect their electricity-derived revenue base by stalling the restructuring process. Another obstacle is the new constitution (1996), which states, under the heading "Powers and Functions of Municipalities", section 156(1), that

> "A municipality has executive authority in respect of, and has the right to administer..
> ..electricity and gas reticulation" (South Africa 1996:83, 144),

which potentially gives local authorities the legal tools to prevent the alienation of their electricity assets.[42]

The debate on restructuring of the electricity supply industry only really began in 1998 with the tabling of the Energy Policy White Paper, which spelt out a tentative programme for the restructuring of Eskom into separate generation, transmission and distribution entities, with a view to possible introduction of competition (1998 Energy Policy White Paper) as a way of improving economic efficiency and transparency. This proposal to introduce market reforms was novel in South Africa: previous proposals for privatisation had not involved restructuring the electricity generation market, which raises questions as to where it originated. The proposal developed in two phases. The first was in the White Paper; the electricity section was formulated by DME electricity section officials and a small group from the EDRC, without Eskom's participation, and the second was in a series of high-level ministerial workshops in 2000 where the same group made a case for restructuring on the basis of Eskom's investment history (Interview with A Eberhard). However, as Eberhard points out,

> "..there has never been a single, powerful champion for reform, neither in government, nor amongst the stakeholders..". (Eberhard 2003:19).

Although a series of processes were set in motion in state agencies to introduce market reforms, including a detailed plan for a market design, any move to a market structure involving the unbundling of Eskom was indefinitely postponed in 2004, on the grounds that it was too risky to restructure the market when new generation capacity was required (Interview with A Eberhard); the outcome was partly a result of Eskom's consistent and subtle lobbying against the proposals.[43]

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[42] The restructuring of the distribution process continued in a piecemeal fashion in 2005: the Cabinet made a new decision to restructure the industry around six 'metro' REDs based on existing distribution assets of the largest South African cities, which supersedes previous decisions on the structure of the REDs (Anton Eberhard, personal communication).

[43] This included the commissioning of a series of studies by the utility to demonstrate the efficiency of the 'single utility' model, and the risks of competitive electricity markets.

In common with other state-owned enterprises, Eskom was corporatised in 2001 via the Eskom Conversion Act, which replaced the two-tier stakeholder governance structure introduced in the aftermath of the De Villiers Commission with an orthodox board of directors. The original policy framework has effectively been replaced by another approach favouring the maintenance of Eskom's dominant position. Two striking developments of the last few years have been 1) the reversion to Eskom of electricity planning processes[44], despite the state's development of an integrated energy planning capacity, and 2) the recreation in the context of the post-apartheid state of Eskom's elite network, both with the political elite, and with a new industrial policy elite. Evidence for this is the ease with which Eskom has elicited support and funding from the Department of Trade and Industry, and the Department of Public Enterprises, for its nuclear reactor development project. Part of the reason for Eskom's success in this regard has been its alignment with the African Renaissance project (supported by its practical involvement during the 1990s in establishing the Southern African Power Pool), its success in internal transformation (training and promoting senior black management), and its outstanding technical capacity. Another more structural reason is the compatibility between Escom's core competency and industrial development strategies currently being pursued by the new government, based on minerals processing and beneficiation.

Conclusion

One of the central features of the development of electricity policy which sets it apart from the development of other policy domains is its unusual institutional structure: application of policy networks models thus requires careful thought, since the central actor in this development, Escom, was at the same time the key industry stakeholder and the state's primary electricity agency, which complicates the application of resource dependency. The main question here is not what the nature and extent of the electricity policy community was, but whether it existed at all, and why: given Escom's level of autonomy, did it feel it was necessary to participate in a policy community, and why?

The basic answer to this question, which will be elaborated on below, is that Escom's participation was based on its primary desire for autonomy, or to keep the state "out of the engine room", rather than a desire to increase profitability, raise prices or extend its market

[44] The reversion to Eskom of the primary responsibility for electricity planning had several dimensions. First, it sidelined the integrated energy planning process, which could have provided other policy alternatives to expansion (or mitigated it) such as energy efficiency or demand-side management. Second, during the 1990s, the NER required Eskom to produce an Integrated Resource Plan for the electricity system, which involved a sophisticated assessment of probable demand growth linked to least-cost interventions (including new plant). This in turn was based on Eskom's own Integrated Strategic Electricity Plan, which was drafted by the planning section in Eskom. The new development had two effects: it marginalised the role of the NER in overseeing the whole system, and also marginalised Eskom's own internal planning system – decisions on recently-announced expansion plans were made by the generation division, rather than the planning division (A Eberhard, personal communication), which constitutes a return to the pre-De Villiers mode of decision-making in the electricity system.

share, which might have characterised industry actors in other policy domains (although these might have been important secondary goals at times). This was related to a wider ideology in Escom, consistent over the 80 years of its existence, which specified its driving ethos, built around a sense of the vital significance of electricity for national development, and Eskom's vital and central role in promoting, developing and sustaining electricity use[45]. The post-apartheid era merely resulted in the extension of this driving ethos to social development (electrification of poor households), and to the development of the African continent as a whole; thus, not only did Escom's leadership strive to protect their bureaucratic autonomy and power by keeping the state out of the engine room, but more importantly they believed strongly that it was (and is) in the national interest to do so. Threats to this autonomy have come from several directions in the last 80 years, including political interference, the threat of a hostile regulatory regime (one which did not share Escom's pricing policy), and the threat of market reform. Escom's engagement with a policy network has consistently been contingent on the existence of these threats.

The context in which these policy networks developed is very significant: in other words, the way in which the electricity policy domain has been defined, which, as pointed out above, was very closely related to the institutional development of the electricity sector. The initial policy process which resulted in the formation of Escom in the 1910s and 20s was situated within a small group of scientific and technical advisors close to the Union's political elite, and their intention in establishing Escom was to create both a national utility and a national electricity *agency*, which would oversee the process of electrifying the nation *as a whole*. Following the formation of Escom, there was a long period of policy consensus (around four decades) during which electricity policy was defined by an 'industrial policy elite' (the most important member of which was the Chairman of Escom for its first 25 years), and by interactions between Escom and energy-intensive users (in particular, the gold industry)

During this period, a series of key developments established the basic institutional contours of the South African electricity system. The central development, brought about by the development of the national grid, and the relationship between Escom and energy-intensive electricity users, was the division between electricity supply and distribution. The outcome of the Borckenhagen Committee decision in the 1960s achieved two things: first, it centralised decision-making concerning both price and electricity planning in Escom, and second, it removed local authorities from the electricity policy domain. Planning was further centralised in Escom by the development of the CGU in 1971. Since there was no other electricity policy

[45] Although it is common to regard these kinds of ethos in state and non-state organisation as merely 'ideological' (deployed with purely strategic aims in mind, which does frequently occur), it is very misleading to underestimate the role that these play in defining the goals and behaviour of organisations *inside* the organisations, and of their leadership. This is borne out in interviews with Escom's leadership.

capacity in government, Escom became the key policy agency, and was instrumental in developing policy proposals and legislation, even in the aftermath of its biggest political defeat, the De Villiers Commission. Until the 1990s, the domain of electricity policy was occupied entirely by Escom, and local authorities were regarded as an autonomous (but subordinate) policy domain. The DMEA in the 1980s, for instance, regarded Escom as a 'law unto itself', which should be integrated into energy policy institutions, but regarded local authorities' electricity systems as a separate domain[46] (Interview with J Basson). The consequence of this was that Escom's specific concerns and focus (electricity for industrial development) came to predominate over a more civically-focused view of the electricity system.

The reason for this can be found in the way that the two domains were delimited. While local authorities were possessed of a level of autonomy which was dependent on other non-electricity or non-energy institutions, the way in which Escom was traditionally understood was in terms of industrial and economic development. An examination of other policy influences during the 1950s and 1960s on Escom (and electricity policy) reveals, behind a high degree of consensus on Escom's central activity (the extension of the electricity supply system), a complex process of bargaining, amongst the political and industrial elite of the apartheid state. Again, the central motivation for its involvement in the nuclear establishment, with the IDC, and in other projects, was to maintain its autonomy, and to a certain extent, to extend its own 'infrastructural power'.

The way in which this was achieved was through the development of a series of informal relationships with key elites within the state, which usually comprised two groups of people: first, the political elite, including key cabinet ministers and the premier, and second, an industrial policy elite. In practice, this involved a delicate process of bargaining and accommodation, and was supported by key economic interests, specifically mining and heavy industry, who added significantly to Escom's prestige and influence within the state. There was a high degree of consensus between Escom, the industrial policy elite and industry, and close collaboration on large energy-intensive development projects such as the Free State goldfields and other 1950s and 1960s energy-intensive industrial developments such as Richards Bay. There was less consensus, but significant strategic bargaining, between Escom and the industrial policy elite on Cahora Bassa, the nuclear issue, and the 1960s hydro projects. Examples of more peripheral but politically important elite pressure included the electrification of politically important rural areas, and electrification of white farmhouses: all these processes were kept within the policy community and not 'politicised'.

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[46] The two exceptions to this were the abortive attempts in the late 1970s and late 1980s to involve local authority distributors in an electricity efficiency programme.

This consensus was disrupted from the mid-1970s by policy crises beginning in the late 1970s and continuing until the mid-1980s. Unlike similar events in the coal industry, the outcome of the crises was not a change in policy paradigm (cheap electricity for industrialisation), but its preservation: the aim of the state was to force Escom to participate in a policy community. In order to achieve this, it was necessary to threaten its autonomy at the highest level.

In addition to the factors cited by Steyn, including structural factors (increases in coal prices, the CDF, an autarkic planning process, an expansionist organisational culture), a fundamental reason for the crises was that Escom refused to negotiate with state agencies or others about what it regarded as its core activity (its expansion programme); as Alan Morgan, Eskom CEO in the 1990s reflected:

> "..right from the days of Jan Smuts [the 1920s], Escom had a fair amount of autonomy, but was never a law unto itself, and I think when Escom started to ignore the politicians, we got the Wim De Villiers Commission.." (Interview with A Morgan).

The reason for the breakdown was the non-integration of Eskom into a newly-emerged network of planning activities structured around strategic responses to the oil crisis, and focused on economic planning processes which integrated large projects such as synthetic fuels, armaments, and energy-intensive industries with macro-economic policies on problems such as foreign exchange and inflation, all within the strategic context of apartheid in the 1970s, which privileged projects with strategic significance such as Sasol. The way in which the crises unfolded is politically significant. During the first crisis, political pressure from outside the state expressed the problem as a price problem, which was dealt with by the state as such (through the BTI); the BTI inquiry was not designed specifically to bring about changes within Escom, and the utility managed to deflect criticism by state agencies by asserting the importance of its central mission (rapid expansion of the electricity supply system), and, more importantly, by building political alliances with the political elite (which defended Escom) and its key consumers, who were wary of too much state interference in Escom's investment behaviour. Thus, by making some concession, Escom succeeded in gaining the protection of the most powerful state institutions. By contrast, a key strategic aim of the second inquiry was to bring about a leadership change within Escom (Steyn 2001:95); by this stage, Escom's planning process was considered to be the problem, and was isolated by the 1983 Commission as the only focus of the inquiry. The outcome of the De Villiers Commission was the integration of Eskom into a new policy context (commercialisation and privatisation of state enterprises), which emphasised its financial performance, and ignored Commission recommendations concerning integration of electricity policy processes in broader energy policy frameworks, or its strong emphasis on energy efficiency as a key plank of electricity policy. There were three outcomes

for Escom's autonomy: first, its prestige as a premier state agency was shattered, which decreased its political power within the state; second, its price-setting autonomy was removed, and it was obliged to gain ministerial approval for price increases annually; and third, the state created the Electricity Council, a stakeholder forum, to govern it. Eskom embarked on a concerted campaign to regain its prestige through international benchmarking, as well as significant restructuring, and removed the state from the price-setting process through the 1991 price compact.

The most significant challenge, however, to the basic institutional structure of the electricity system, and potentially to Eskom's autonomy, was the transition to a post-apartheid state in the early 1990s. The key issues of the transition, accountability and control of electricity institutions, and their social utility, were focused on a single practical issue, electrification, which significantly changed the boundaries of the electricity policy domain. The distribution industry, previously ring-fenced in a relatively autonomous policy domain, was viewed as one of the key areas of intervention in electricity policy by the new government-in-waiting. Policy consensus on the necessity for thoroughgoing institutional reform in the electricity system was underpinned by universal support for the electrification programme; institutional reform was seen as a major factor in the success of the programme, particularly of the fragmented distribution industry. These developments were underpinned by the collapse of the boundaries of the 1980s electricity policy community, allowing a number of additional participants into the policy process during the transition. The focus of electricity policy shifted from industrial policy to social policy and institutional reform; this, however, was a temporary process which expired at the end of the transition, with only two permanent outcomes: the electrification programme, and the NER.

The process of institutional reform began with the establishment of a National Electricity Regulator, but stalled after this. There are a number of reasons for this. The first, and possibly most significant, is the way in which the electrification programme was planned and implemented. First, electrification was the basis for a détente between Eskom and the new government: aside from other motives of Eskom's leadership, Eskom successfully traded its resources (finance, technical capacity, institutional resources) to both manage neglected distribution areas and to carry out mass electrification, for political legitimacy; in the process it developed a corporate ethos suited to the new political environment. Escom emerged from the process (and a process of internal transformation) not as an apartheid-era institution, but as a powerful state agency involved in mitigating the effects of apartheid. Second, the success of the electrification programme, and of the ad hoc institutional innovations which accompanied it, including Eskom's takeover of bankrupt distributors and the general rationalisation of local authorities, undermined the political consensus underlying institutional reform policies: since

further institutional reform appeared to be unnecessary to accomplish electrification, political interest dissipated, the policy window closed, and the only remaining advocates of reform were a few less-influential state agencies, including the DME's newly-created electricity section, and the NER, and other 'policy entrepreneurs' without a significant political base. Third, traditional policy communities within the electricity system were resuscitated in a modified form by the end of the 1990s, and further undermined reforms in the absence of a clear pro-restructuring coalition; the new government began to see Escom as a powerful agent in the African Renaissance, and appreciate it in its traditional industrial development role. Local authorities, badly-organised and lacking legitimacy (due to their apartheid inheritance) during the transition, were able to organise effectively and build alliances with relatively powerful state agencies such as the Treasury. Eskom, having re-established its network with the new political and industrial policy elite, was in a strong position to resist reforms aimed at reforming the electricity market, and breaking the utility up into competing units.

The relationship between these key developments in electricity policy and the development of energy policy begins in the 1970s, with the oil crisis. Unlike the situation in other countries, the hermetic nature of the South African electricity system, with no dependence on liquid fuels, and with limited substitution possibilities of electricity for liquid fuels in the economy, excluded electricity policy from the strategic considerations which were the one of the main drivers of the creation of energy policy institutions in the early 1970s, with the important exception of the co-ordination of Escom's coal procurement processes with coal policy objectives. An additional factor was the institutional nature of the electricity system: unlike other areas of energy supply-related policy, there was no existing electricity policy or regulatory capacity within government departments. While Escom was represented at the highest level in key energy policy-making bodies such as the Energy Policy Committee, key electricity policy decisions, such as planning processes, price-setting, and the launching of new projects, were in no way integrated into energy policy institutions or processes. At the same time, electricity policy was defined in terms of supply only[47], both for institutional reasons, and because of the prevalent energy policy paradigm of the time; electricity demand was excluded from consideration, except for a brief period in the NEC in the 1980s.

It was hoped by energy bureaucrats that the creation of the DMEA, and then the NEC, would be able to integrate Escom into energy policy processes and institutions further. The ECB was partially integrated into the DMEA in 1980, which added to pressure from state agencies resulting in the De Villiers Commission, since in the wake of the BTI's inquiry it had gained

[47] As opposed to both distribution and demand.

some capacity to assess Escom's performance[48]. Although the Commission contained significant proposals for the integration of electricity policy into a broader energy policy framework, ironically, the outcome of the Commission had the opposite effect: the role of the ECB was curtailed further, and Eskom was shifted to another Department (The Office for Public Enterprise); in any case, overcapacity had deferred any further planning decisions for around two decades. The other key plank of the Commission's recommendations, energy efficiency, was allocated to Eskom, and did not result in the Department developing its own electricity policy capacity.

The radical (but temporary) openness of the transitional period held significant promise for further integration of electricity policy into a general energy policy context, especially one widely supported during the transition based on social, environmental and economic sustainability: however, this failed for both institutional and political reasons. Institutionally, the creation of the NER was a very significant milestone, and created a genuinely independent source of expertise on the electricity sector. The political consensus which created it was based on two different factions: ANC-aligned policy activists saw it as a bulwark against Eskom, which they did not trust at the time, and the electricity industry saw it as a bulwark against the new state. Although the ANC faction in NELF saw it as a key instrument in promoting institutional reform in the electricity sector, its very independence compromised its ability to perform this role, which it handed back to the state early in the restructuring process. The general institutional reforms necessary to implement an integrated energy policy were lacking (especially on the demand side), and the integrated energy planning process, when it was implemented, was institutionally weak and ineffective as a means for integration. Although the DME created an electricity policy capacity (initially to house the electrification programme), it struggled to compete with the network of top-level interaction which Eskom developed with the new political and bureaucratic elite, which comprised a new electricity-industrial policy community. Another factor was the remarkable success of the electrification programme, which restored Eskom's prestige, and further undermined claims by energy policy activists during the transition that an integrated energy policy, especially for households, was a prerequisite for tackling energy poverty (see below). The crucial development, however, was that after the government suspended ESI market reform in 2004, decision-making about future expansions to the electricity system reverted completely to Eskom, which removed it from an energy policy context. This was the opposite of the scenario agreed to in the 1998 White Paper, which proposed market reform which would have displaced the planning function from Eskom; the state would then have influenced market structure through electricity policy.

[48] This mainly involved the appointment of a finance expert who had worked on the inquiry, Professor I Lambrechts, to the ECB.

The result of this non-integration was that the central electricity policy paradigm proved to be remarkably durable: from the 1920s to the 2000s, electricity supply problems were solved primarily by expanding the electricity system. Other measures, including integrated energy planning, demand-side management, energy efficiency, and macro-economic or industrial strategies aimed at intervening in the growth of electricity demand, were applied only sporadically, or not at all: demand-side management was supported by Eskom briefly in the late 1990s for strategic reasons, to delay the requirement for new capacity (which would in terms of policy at the time have been built by a private supplier as a prelude to the introduction of a competitive market); electricity conservation was supported sporadically (after pressure from the De Villiers Commission) in the late 1980s, partly to manage peak load problems, until overcapacity in the early 1990s caused Eskom to switch to promoting additional electricity-intensive projects. During the same period, the DMEA has not developed any effective conservation or energy efficiency programmes.

In terms of the paradigm framework outlined in Chapter 2, electricity policies fall clearly into paradigm 0 until the 1970s. Limited substitution, and the integration of electricity and coal policy in the 1970s resulted in a limited integration of some aspects of electricity policy into a broader energy policy framework, although there was almost no institutional or policy integration. Despite sporadic pressures for paradigm 2-type policies, the lack of institutional capacity and the way that the electricity policy domain was defined excluded these types of policy from elaboration or implementation. An interesting example is electrification, referred to above: while proponents of electrification in the early 1990s in organisations such as the EDRC were also proponents of integrated energy planning, and integrated demand-side solutions to problems such as energy poverty, institutional and political factors had by 1994 framed the energy poverty problem (a complex problem related to the lack of energy services) as an electrification problem (a lack of electricity). This was due to a) the openness of Eskom to address energy poverty through electrification (and to finance and co-ordinate it); b) the lack of the same kind of development in other supply sectors, particularly in the liquid fuels sector (see Chapter 6); and c) the failure of the new government to develop suitable policy capacity to achieve this. The success of the electrification programme (which did not adequately address the energy poverty problem) deferred the development of other policy responses, and removed the impetus for institutional reform both in terms of electricity and energy policy more generally.

Chapter 5

The Development of South African Nuclear Policy

Overview

The South African nuclear programme was characterised by the last apartheid president, FW De Klerk as

> "..yet another major expense which we would never have undertaken had it not been for our growing isolation and sense of confrontation with the international community. Ultimately, it was yet another cost of apartheid and of sanctions" (quoted in Conradie & Messerschmidt 2000:212).

Of electricity sent out from South African power plants between 1970 and 1998, around 4% was generated by the country's sole nuclear power plant, Koeberg. During the period when South Africa was manufacturing its own nuclear fuel, this process probably consumed around ¼ of electricity generated by Koeberg. However, even though the programme was insignificant in terms of its impact on the energy system as a whole, it was significant for three reasons: first, between 1970 and 1999 it was allocated around R31 billion (2000 rands)[49], a significant allocation of resources; second, it was regarded for a period as the medium-term successor to coal as the country's primary energy source; and third, because it is currently undergoing a renaissance in the form of the Pebble-Bed Modular Reactor, strongly backed by the current government.

There are three distinct aspects to the South African nuclear sector. The first is the production of natural uranium (which is sold on the world market), mostly as a byproduct of gold mining, which is undertaken by the private sector. The second is the state nuclear programme, which has involved a range of research and manufacturing activities, including nuclear weapons and fuel. The history of this programme can be divided into six phases.

The initial phase involved an agreement with the UK and USA to produce uranium (mostly as a by-product of gold mining) and sell it entirely to them for their weapons programmes, which

[49] By comparison, Escom's capital expenditure in 2000 rands over the same period was R302 billion.

lasted until 1970. In the second phase, a South African research programme was set up in the late 1950s. By the end of the 1960s, the programme had reached maturity, and the third phase was embarked on: construction of a pilot enrichment plant, as well as a nuclear weapons programme. The fourth phase, the most significant in terms of scale and resources, began in the late 1970s, when a decision was taken, based to some extent on South Africa's inability to buy nuclear fuel on the world market due to nuclear sanctions, to initiate a full fuel cycle, which began operating towards the end of the 1980s. The fifth phase, concurrent with the end of apartheid, saw the decommissioning of the fuel cycle plants, leaving only a range of peripheral activities, including the research reactor, SAFARI-1. The sixth phase could possibly involve a limited renaissance, based on fuel fabrication for the PBMR.

The third aspect of the South African nuclear sector is the nuclear plant Koeberg, consisting of two 900MW French-built pressurised water reactors, the construction and operation of which has been relatively autonomous from the state's nuclear establishment, other than a period in the late 80s and early 90s when Eskom was forced to buy fuel from it. Eskom is currently attempting to develop its own nuclear reactor technology.

Actors and Institutions

1) International Actors

South Africa's long involvement in world nuclear affairs was an outcome of the discovery of uranium reserves in the 1940s, which was used as leverage by a series of South African prime ministers, beginning with Smuts in 1940, to gain access to nuclear technology and expertise. This integration into the weapons programmes of the UK and USA as one of the key uranium producers at the dawn of nuclear technology was facilitated via Jan Smuts' role (then Prime Minister) in Churchill's War Cabinet. Smuts not only realised the strategic importance of uranium, but was also personally an avid believer in the promise of the Nuclear Age; on meeting Niels Bohr in the 1940s, he commented:

> "This is tremendous, as though one is meeting Shakespeare or Napoleon – someone who is changing the history of the world" (Newby-Fraser 1979:20).

Smuts performed a key role in an initial round of nuclear diplomacy, which culminated (after his death) in 1950 in an agreement with the Combined Development Agency, a co-operative uranium procurement agency set up by the USA and UK (Newby-Fraser 1979:24), to buy all South Africa's uranium production. In 1958, declining requirements by the CDA for uranium led to modifications to the agreement, which allowed South African producers to sell the surplus elsewhere. The final contracts of the agreement terminated in 1970 (Hofmänner 2002:135). Uranium was thought to be a scarce mineral at the time, and few large deposits had been

discovered; as a result South Africa was granted privileged access to both foreign nuclear expertise and to international nuclear forums. The CDA agreement

> "..positioned [South Africa] as a leading uranium producer, and gave the country status in developing international atomic energy relations.. ..from 1953, South Africa supplied the US and Britain with huge amounts of uranium and this enabled her direct involvement with atomic energy authorities in both countries" (Hofmänner 2002:135).

The close ties to the UK and USA nuclear establishments allowed the South Africans to profit both through ties with specific programmes (and the acquisition of a research reactor from the USA through Eisenhower's 'Plowshares' programme) and concomitant technology transfers, and through participation in international nuclear organisations, initially participating in United Nations conferences on nuclear energy, before becoming one of the founder members of the International Atomic Energy Agency (IAEA) in 1957.

The country retained a seat on the IAEA's Board of Governors (ironically, as African representative) until 1976, when South Africa was removed because of international anti-apartheid pressure (Newby-Fraser 1979:10-12). Following this, South Africa was gradually excluded from the international nuclear establishment, a process which was accelerated when it became plain in the late 1970s that South Africa possessed a nuclear weapons capability (Hofmänner 2002:138). South Africa's active involvement in the international nuclear establishment only commenced after its accession to the Nuclear Non-Proliferation Treaty (NPT) in 1991, and the country began to play a significant role again in the late 1990s, and again has a seat on the IAEA's Board.

2) The Nuclear Establishment

The term 'nuclear establishment' is used in this context to refer to the collection of state agencies whose chief function was to develop and promote nuclear technology in South Africa. The initial aim of government nuclear institutions in South Africa was to oversee the uranium exploration and production process on behalf of the state. Initially this was done through a Uranium Research Committee set up in 1946 by Smuts, but this was succeeded in 1948 by the Atomic Energy Board, established in terms of the Atomic Energy Act (35/1948), which gave the board wide powers to control and oversee all aspects of uranium production, nuclear technology and nuclear power.

In the 1950s, the AEB extended its functions from regulation to research, and initiated a research programme into various aspects of nuclear technology from the late 1950s. By the end of the 1960s, research was focused on enrichment technology, and a separate subsidiary, the Uranium Enrichment Corporation (Ucor) was created, partly to separate the strategic elements of the programme from the rest of the nuclear research programme. The primary function of Ucor was

to implement enrichment research in the construction of the so-called 'Y-Plant', a pilot plant using the South African enrichment technology, which was extended in the mid-1970s to produce weapons-grade enriched uranium. Research was conducted on nuclear explosives, in the early 1970s allegedly for civilian applications (so-called 'peaceful nuclear explosives'), and from the late 1970s for military use (Hofmänner 2002:313). A relationship was developed in the late 1970s with Armscor, the state weapons manufacturer, who took over the 'military' side of the nuclear weapons programme. In the late 1970s, work began on a scaled-up enrichment plant which would produce nuclear fuel for Eskom's new nuclear power plant.

A restructuring process was undertaken in 1982, pursuant to a Cabinet-appointed inquiry, which resulted in the establishment of the Atomic Energy Corporation in terms of the Nuclear Energy Act (92/1982), a holding company for Ucor and the Nuclear Development Corporation (Nucor), a newly-created subsidiary comprising the non-Ucor functions of the AEB. In 1985, PW Botha ordered a halt on further development in nuclear weapons, and Ucor was merged into the rest of the AEC as part of a restructuring exercise which marginalised the strategic weapons-related aspects of the AEC's activity and centralised the nuclear fuel cycle elements. In 1989, President De Klerk ordered the dismantling of the weapons programme, and the Y-Plant was shut down in 1990. The domestic fuel cycle reached its peak production in the early 1990s, and was sequentially shut down in the mid-1990s, experimental enrichment programmes were terminated, and the AEC was restructured in 1999 as the Nuclear Energy Corporation of South Africa (NECSA) in an effort to commercialise some of its remaining peripheral technologies, since by this point it did not have any programmes remaining which related directly to nuclear power. The new government was also keen to 'rebrand' the organisation to dissociate it from its apartheid past. Currently there is a possibility that NECSA will fabricate fuel for the PBMR, if it is commercialised.

3) Regulatory Agencies

The original institutional framework vested all regulatory powers pertaining to nuclear materials and technology in the AEB. In 1963, the Nuclear Installations (Licensing and Security) Act (43/1963) was passed, which stipulated that all nuclear installations had to be licensed by the AEB (including the AEB's own installations). This self-regulation continued until 1982, when the Nuclear Energy Act (92/1982) created a quasi-independent Council For Nuclear Safety. In terms of the Act, the AEC still granted licenses for nuclear installations, but was obliged to consult the council. The Council's administrative functions were carried out by the AEC, the Council consisted mainly of personnel from the nuclear establishment, and the Minister could designate AEC employees to attend Council meeting to 'advise' the Council (Clauses 24-27).

This pseudo-independent regulation continued until 1988, when the CNS was separated from the AEC, and given jurisdiction over the licensing process (Nuclear Energy Amendment Act 56/1988), although still dependent on seconded AEC staff. The CNS was replaced in 1999 by a fully-independent National Nuclear Regulator in terms of the National Nuclear Regulator Act (47/1999).

4) Other State Agencies and Structures

The most significant agencies outside the nuclear establishment have been Eskom, Armscor, the IDC, and the PBMR project. Armscor's role was limited to the nuclear weapons programme from the late 1970s to its termination in the late 1980s, and involved the manufacture of nuclear explosives.

Eskom was involved in a series of inquiries, and represented on a series of committees, investigating the feasibility of nuclear power in South Africa from the late 1950s onwards, usually representing Escom, the nuclear establishment and the IDC; Escom was also represented on the AEB's board from 1958. Escom developed its own nuclear engineering division in 1969, as a prelude to the development of its limited nuclear power programme, which began with the construction of Koeberg power station in the 1970s. The involvement of the nuclear establishment in the operation of Koeberg has been limited to three areas: 1) licensing; 2) nuclear waste disposal, which is the statutory responsibility of the nuclear establishment; and 3) the development of an indigenous nuclear fuel cycle, which produced fuel for Koeberg from the late 1980s to the early 1990s, after which it ceased production. Eskom's nuclear programme escalated during the 1990s through its involvement in the Pebble Bed Modular Reactor project, a high-temperature gas-cooled reactor concept, which had been developed by former AEC engineers; however, the project is still at a conceptual stage.

The IDC's role, brokered by its chairman Van Eck, was significant in the 1950s and 1960s in exploring and developing common ground for the development of nuclear power in South Africa between Escom and the AEB, although available evidence indicates that its role decreased once the contours of the nuclear power programme had been established in the late 1960s. The IDC re-entered the nuclear arena in the late 1990s, taking a significant stake in the PBMR project.

Another key category of government structures consisted of government departments. The line department, under which authority the AEB nominally fell, was the Department of Mines, on account of the AEB's regulatory role in the uranium industry. This department subsequently became the DMEA in 1980. However, in reality very little interaction occurred between the Department and the nuclear establishment until the late 1990s. While the nuclear establishment liaised frequently with its line minister (and often the premier), the Department of Mines did not

develop any nuclear policy capacity. When the DMEA was created in 1980, unlike other energy functions and institutions, the nuclear establishment was not transferred to the Energy Branch, and aggressively protected its monopoly on nuclear policy activity: energy-related state agencies frequently used the term "non-nuclear" to emphasise that they were not trespassing in the AEB/AEC's domain. Until the DME created a nuclear energy section in the late 1990s, policy and legislation were developed by the nuclear establishment itself, which

> "..had its own legal office and employed its own legal advisor.. ..and was directly involved in drafting legislation" (Hofmänner 2002:140).

Policy initiatives, budget requests and large-scale programmes were usually approved by a select group of cabinet ministers, usually including the premier; from 1990 (the end of the nuclear establishment's strategic role) political access and influence declined considerably (Interviews with W Stumpf, A Jackson, W Grant, J Basson).

5) Uranium Production

Uranium production, an outcome of the CDA agreement, was begun by private mining houses in the 1950s, and has been marketed by a co-operative organisation called the Nuclear Fuels Corporation (Nufcor) since, owned and operated by the Chamber of Mines (Auf Der Heyde 1993:33). South African production began in 1952, and peaked in 1980 at 7292 tons uranium oxide (DME 1994:9), before declining in the 1990s, partly as a result of declining world prices, and partly as a result of the decline of gold-mining, of which uranium production is a by-product. Most of the local production has been exported: of a total production (to the end of 1992) of 94.184 kilotons of uranium, 4.774 kilotons have been sold locally (Auf Der Heyde 1993:33). Local sales began in 1980.

There have been significant shifts in policy regarding the nature of the uranium resource; initial enthusiasm in the 1950s and the 1960s perceived local reserves as an indigenous source of energy and a raw mineral to which value could be added by beneficiation (conversion and enrichment); this was translated into esteem for the strategic value of indigenous resources in the 1970s and 1980s. Initial plans for a large-scale conversion and enrichment plant were shelved in favour of a small-scale 'semi-commercial' plant, which produced enough fuel only for Koeberg. Enthusiasm for a local uranium fuel cycle waned sharply in the 1990s, as the massive cost of the fuel programme became apparent, and the transition coupled with South Africa's accession to the NPT gave Eskom unfettered access to the world nuclear fuel market. In addition, hostility by the new ANC government to the nuclear establishment limited any further ambitions concerning local uranium processing.

Local resources were put back on the map at the end of the 1990s by a combination of three things: the first was the enthusiasm for minerals beneficiation in South Africa, which has again become an important plank in government's minerals policy; the second was the conceptual resurrection of uranium by the government's Integrated Energy Plan, which classed local uranium as a domestic energy resource[50], and the third related development was the ANC government's newly-found enthusiasm for nuclear power, and the PBMR project in particular. The media reported in 2005 that "..government wants to establish nuclear energy as a major supplier of power in South Africa, and the country must be able to supply its own energy requirements"; the same report quoted a DME official as saying that consideration was once again being given to enrichment (Business Day 8/6/2005, titled "Government yokes glowing potential of uranium to SA's energy demands").

The Political Economy of Nuclear Power in South Africa

Secrecy surrounding the nuclear programme renders attempts to delineate the real costs of the programme futile; however, there is some useful information in the public domain. From an energy policy point of view, there are two potential areas of interest. The first is the economics of the fuel cycle[51], and the second is the economics of the Koeberg nuclear power plant. Figure 5.1 below represents real funding (from the fiscus) of the nuclear establishment from 1970 to 1999, which amounted to a total of R30.8 billion (2000 rands) over this period. The aggregate figures presented here include the weapons programme, sundry research programmes, the capital and operating costs of the fuel cycle plants, and loan repayments, which, although the loans were incurred in the 1980s, continued into the new century. However, the trend clearly indicates the massive increase in funding necessary to implement the fuel cycle; by comparison, the weapons programme, based on the Y-plant, which was constructed from 1971 and commissioned in 1978,

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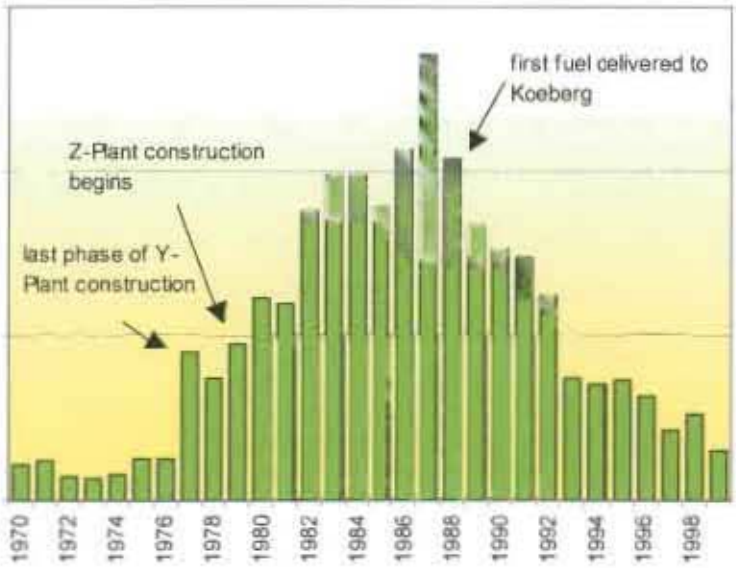
[50] It might seem odd to claim that domestic uranium resources do not constitute a domestic energy resource; however, the nature of enrichment technology (massive economies of scale, combined with the fact that most of the cost of nuclear fuel is the processing rather than the uranium itself), the comparatively small amount of uranium which is required to produce nuclear power, and the concomitant ease with which it can be stockpiled, renders the provenance of the raw metal irrelevant, unless domestic resources have a high energy security value, as the South African ones did under apartheid in the context of the weapons programme. The French nuclear programme, for instance, was motivated by a significant energy security component, since even though very little uranium is produced in France, a number of years' fuel and raw materials supply can easily be stockpiled. The implication, therefore, of a synergy between uranium resources and the presence of an energy resource, is a paradigm 1 conceptual error, since energy resources are entirely defined by the presence of conversion technology, which in the case of uranium is not merely a set of power plants, but a whole fuel cycle. In the absence or unaffordability of this technology, natural resources cannot be referred to as energy resources; similarly hydrogen could be referred to as an indigenous energy resource if fusion technology was viable.

[51] The nuclear fuel cycle consists of the series of stages involved in the production and use of nuclear fuel, which are considerably more elaborate than for conventional fuels, not least because of the hazardous nature of the material. Briefly the stages of the fuel cycle are as follows: uranium ore is mined (in other locations, from a dedicated uranium mine, but in South Africa uranium is extracted from gold-bearing ore once the gold has been removed), the uranium is extracted, which produces a concentrate of U3O8, or 'yellowcake'. This is converted to a gas, UF6, so that it can be enriched (see footnote 12 below). Once it has been enriched, it is converted into UO2 in the form of a powder. In the next phase, the fuel fabrication phase, it is manufactured into appropriate fuel assemblies (depending on reactor type), and placed in a nuclear reactor. When the fuel is exhausted, it is removed from the reactor, and either reprocessed (to reclaim unspent fuel or plutonium), or stored, and finally (when decisions are taken about long-term storage), placed in a long-term storage site for at least 100 000 years.

Figure 5.1: Funding of the Nuclear Programme (2000 Rands)



was a relatively low-budget exercise. Liberman (2001:55) estimates, based on figures provided by Armscor and the AEC, that the weapons programme cost between 600 million and 1.2 billion rands in total (in nominal currency spread over a decade or more, and thus not easy to relate to the above figures). Attempting a more precise analysis, Van Horen calculated that the combined capital, operating and finance charges attributable to nuclear-power related activities in the AEC (conversion, enrichment, fabrication, decommissioning and waste disposal) came to R12.2 billion (1995 rands; R16.98 billion in 2000 rands) from 1971 to 1995 (Van Horen 1996b:65), or 57% of total grants from the fiscus to the nuclear establishment during this period. It must be borne in mind that these figures reflect only the state subsidy, and not the income from fuel sales; thus the total cost of the fuel programme was considerably higher, given the premium being paid by Escom for locally-produced fuel. This also excludes a R100 million (assuming 1983 money, around R683 million in 2000 rands) 'advance' from Escom on the fuel fabrication plant, which was repaid in kind[52] (Interviews with W Stumpf, AEC CEO, Alan Morgan, Eskom CEO).

Aside from the significant direct state expenditure on the fuel plants, there is some data on the economics of the fuel itself, which gives some idea of Eskom's subsidisation of the nuclear programme. Thus subsidy happened in three ways; the first was the loan mentioned above; the second was the price paid for fuel, and the third was in the form of concessionary rates for electricity (Interviews with W Stumpf, A Morgan) for the enrichment plant.

The key feature of the South African enrichment technology was its relatively low capital cost, but extremely high use of electricity: this would potentially have given a commercial-scale plant a competitive advantage in the early 1970s, but electricity price increases since then rendered the actual plant uncompetitive. Auf Der Heyde (1993:11) compares three commercially-utilised

[52] The loan was repaid in nuclear fuel. Given that Eskom paid significantly more than the world price for local fuel, this was at least partly a grant.

enrichment technologies in terms of electricity consumption per Separative Work Unit[53] (SWU): the Becker nozzle technique (analogous to the South African method) uses 3000 kWh/SWU, the diffusion method uses 2500, and the centrifuge method uses only 50. Actual published figures for the AEC enrichment plant indicated 9200 kWh/SWU (Auf Der Heyde 1993:11), reducing the plant to a strategic asset only. Van Horen estimates that of the total state subsidy, 41% was spent on operating expenditure, of which a large proportion was most certainly on electricity (Van Horen 1996a:96). The AEC consumed 2180 GWh in 1993 (Mountain 1994:116), which comprised 1.5% of Eskom's total sales for the year, and 30% of Koeberg's output for the year (Eskom Annual Reports). Operating costs coupled with the standard applicable Eskom tariffs indicated that the AEC was buying electricity at considerably below normal tariffs (Auf Der Heyde 1993:28).

The AEC's costs for fuel production were at least 10-20 times the world price, excluding capital costs (Auf Der Heyde 1993:35). The following table, based on Auf Der Heyde (1993:27), indicates the AEC's costs (including capital costs), the world spot price, and the AEC price in 1993 for conversion, enrichment and fuel fabrication:

	Conversion (R/kgU)	Enrichment (R/SWU)	Fuel Fabrication (R/kgU)
World Spot Price	15.51	224	1100
AEC Price	24	619	1394
AEC total cost	70	1438	4624

What is notable about these figures is the significant difference between the AEC price and the world spot price, but also the even more significant difference between the AEC's costs and AEC selling price, which, combined with a further fall in the world spot price in the wake of the end of the cold war, resulted in the decommissioning of the whole fuel cycle by the end of the 1990s. Estimates for the total premium paid by Eskom, excluding any inherent electricity subsidy, is estimated by Auf Der Heyde at around R44 million (around R100 million in 2000 rands) per year for the period 1988-92 (Auf Der Heyde 1993:29). Van Horen estimates that the external cost of the state nuclear programme (in terms of fiscal subsidies) for electricity generation amounted to around 3c/kWh (in 1995 rands) for nuclear power, against an average selling price for 1995 of 11.15 c/kWh.

The economics of the Koeberg power plant are difficult to assess, because of a lack of data as well as the problems of making meaningful comparisons. Eskom's official history claimed that the operating costs of Koeberg in 2000 were around R50/MWh, compared to R30/MWh for a large South African coal-fired power plant (Conradie & Messerschmidt 2000:215), although the

[53] A unit to measure quantity of enrichment, used as the basis for pricing enrichment services.

basis for these figures is unclear (particularly whether depreciation is included). Another complication is that Koeberg provides electricity in the Cape, 1500km away from a comparable pithead power plant. The construction of Koeberg suffered from the usual cost inflation, delays, and overruns typical of nuclear plants (Christie 1984:197), as well as a significant cost incurred through sabotage of the plant just before commissioning, which delayed its start-up for a year. A comparison would thus also have to include the cost of transmission operation and infrastructure. Aside from the theoretical capital and operating costs, Thomas argues that Koeberg's operating history is poor, and thus,

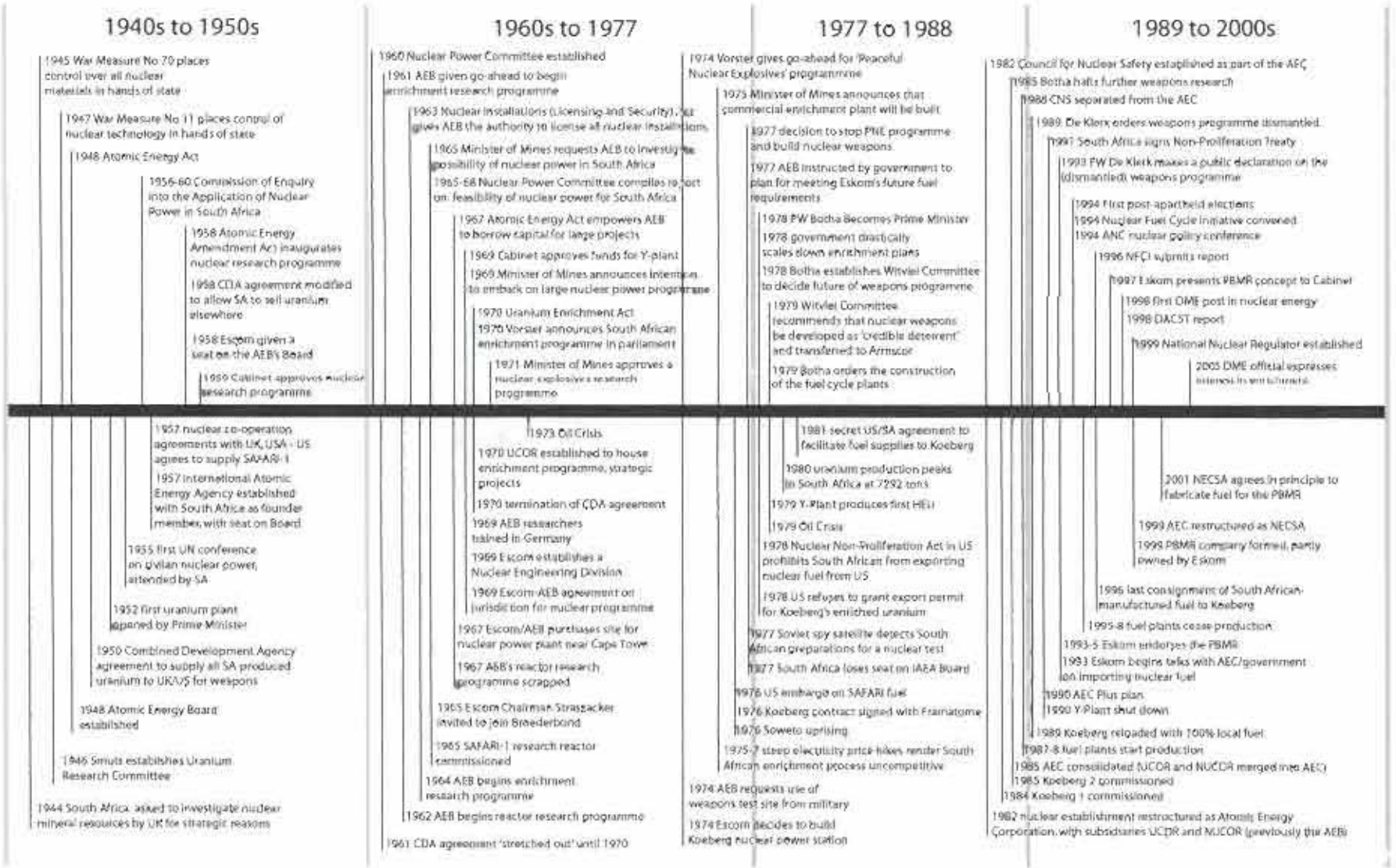
> "..it is unlikely to be providing as large a stream of income as was originally expected to repay the capital charges and to provide funds for its eventual decommissioning.." (Thomas 1996:6),

although its operating record has improved considerably since then. Consensus amongst Eskom's leadership in the 1990s was that economic reasoning was not the dominant motivation for building Koeberg (Interviews with I McRae, A Morgan).

The Development of Nuclear Policy

The development of nuclear policy occurred in four phases, which are reflected with key policy developments in Figure 5.2 below. Nuclear policy in South Africa began in the wake of the second world war, when South Africa was integrated into the joint UK-US nuclear weapons development programme as a key supplier of uranium, produced through a collaboration between the state, which held the legal rights to all nuclear-related activity and technology, and gold-mining concerns, which co-operatively established uranium production facilities. This international collaboration led to considerable technical and scientific interaction with the UK, the US and other international bodies, which in turn stimulated keen interest in developing a nuclear technology capacity in South Africa. The second phase, consisting of the development of a nuclear research and technological capacity, began at the end of the 1950s, and culminated with the construction and commissioning of a pilot enrichment plant, modelled on a locally-developed enrichment technology in the 1970s, which was concomitant with a strategic nuclear weapons programme. From the mid-1970s, South Africa was committed to nuclear power with the ordering of a nuclear power plant, and at the end of the 1970s, the third phase began, which involved the scaling up of the enrichment process, as well as the construction of other key components of the nuclear fuel cycle, with the aim of becoming fully self-sufficient in nuclear fuel for strategic reasons. The fourth phase, beginning with the accession of F.W. De Klerk to the presidency, saw the dismantling of the weapons programme and the nuclear fuel cycle, as nuclear fuel became available to South Africa through other channels, and the economical

Figure 5.2: Key Policy-related Developments in the Nuclear Sector



unsustainability of the programme became apparent. A key development at the end of the 1990s was the embracing of nuclear power by the post-apartheid government as a potential future energy source.

1) 1940s to 1950s

Nuclear policy during this period developed in two phases: in the first, government control (and secrecy) was established over all nuclear-related activities through a range of measures culminating in the establishment of a separate nuclear institution. The second phase consisted of the launch of a government nuclear technology research programme, which was placed within this restrictive framework rather than within a more orthodox scientific or technical context.

From 1945 to 1950, an institutional framework was established on the basis of an agreement between the South African government and the CDA to prospect for uranium and explore the prospect of South Africa supplying the USA's and UK's nuclear weapons programmes. To this end, government instituted War Measure No 70 of 1945, which vested in the state the sole right to explore for, produce or trade nuclear material, and War Measure No 11 of 1947, which vested the right to nuclear technology (including patents and nuclear energy technology) in the state (Hofmänner 2002:138). Further, Smuts established a Uranium Research Committee to oversee the investigation. These measures were put on a permanent footing by the Atomic Energy Act (35/1948), the aim of which was:

> "..to provide for the control of prospecting and mining for and treatment of certain materials and of ores containing such materials, of the processing, concentration, purification and use of such materials, and of the production and use of atomic energy and radioactive isotopes, and for that purpose to establish an Atomic Energy Board and to define its functions; and to provide for the control of certain patents and for other incidental matters." (Atomic Energy Act 35/1948: 'Aims').

The Board was given wide powers to enforce, control and oversee the extraction and processing of nuclear materials, and also the right to produce nuclear energy, which was at that time only a theoretical possibility. The Act also contained a stringent secrecy clause which stated that:

> "No person shall, without the consent in writing of the chairman or the deputy chairman of the Board, communicate, transmit or make known to any person, whether in or outside the Union, any information in regard to reserves of ores containing any prescribed material or the annual output of such material or ores by any person or the price paid to any person in respect of any such material or ores, or any information or particulars of any investigation or research or any discovery or invention relating to the processes or use of any prescribed material or the production of atomic energy, or any such investigation or research financed wholly or partly by the Board or the State and relating to prospecting or mining for or

treatment of ores containing any prescribed material." (Atomic Energy Act 35/1948:Clause 28(1)).

The culmination of investigations in the 1940s into the presence of uranium in South Africa revealed that uranium could be produced as a by-product of gold mining, and two agreements were entered into: the first between the CDA and the South African government, whereby the CDA would finance uranium processing plants at various gold mines, and would buy South Africa's entire production at a price which recognised the strategic nature[54] of the commodity. Subsequent amendments to the agreement in 1958 and 1961, which lifted the restrictions on end-use by the USA and UK (the original agreement specified military/strategic only, whereas by the 1950s, civilian use became a possibility), and removed the limitation on selling to other parties, as well as "stretching out" the total amount contracted to 1970 (Hofmänner 2002:135, Henshaw 1989:317). The first uranium plant was opened by the Prime Minister, D F Malan, in 1952 (Hofmänner 2002:135).

The 1950s was a period of exploration of the potential of nuclear technology for the network of South African government officials, scientists and engineers who were part of the embryonic nuclear establishment. This exploration was significantly aided by international linkages facilitated by the CDA agreement. The key event was a government-sponsored mission to Europe in 1955 which consisted of, amongst others, several key figures in the later development of the nuclear establishment: Dr H Van Eck[55], prominent industrialist and chairman of the IDC; Dr J T Hattingh, chairman of Eskom; Dr M Naudé, head of the CSIR and board member of the AEB; and Dr A Roux, later head of the AEB. The mission attended the First United Nations Conference on the Peaceful Uses of Atomic Energy in Geneva (Newby-Fraser 1979:31), as well as undertaking a study tour of the United Kingdom's nuclear technology programmes, which was undertaken as part of a series of negotiations then underway to amend the CDA treaty to permit the UK and USA to buy uranium at the "strategic" price for civilian use (Henshaw 1989:318). The South African government,

> "..in seeking to draw strength from the possession of uranium.. ..was undoubtedly aware that it was exceptionally well-placed to acquire the technology and the industrial capacity which would assure the Union of a leading position in the atomic field.." (Henshaw 1989:321-2).

Sources differ on the mission's report: Henshaw asserts that the mission reported that nuclear energy was not yet economically viable, but that co-operation agreements should be concluded in this field with both the UK and USA; additionally, the production of heavy water should be

[54] "South Africa (along with other producing countries) had been asked to forgo additional financial advantages in the interests of Western security.." (Henshaw 1989:316)

[55] The UK regarded Van Eck as the most important and influential member of the mission (Henshaw 1989:319)

explored in the Union[56] (Henshaw 1989:321); whereas Newby-Fraser concurs on the nuclear co-operation recommendation, but adds a recommendation that nuclear scientists be trained in South Africa, and that a nuclear power plant should be constructed in Cape Town (Newby-Fraser 1979:33). Although Henshaw is probably more reliable[57], the difference is probably due to a split in the mission between pro- and anti-nuclear power factions: Hattingh, the chairperson of Eskom, was extremely sceptical about the application of nuclear power in South Africa, and apparently almost came to blows with Naudé on the subject (Newby-Fraser 1979:32), whereas Van Eck, Naudé and Roux were enthusiastic supporters.

The AEB utilised the political momentum of the mission to lobby for a commission of inquiry, and an AEB committee, including Van Eck and Naudé, drafted the terms of reference of the 'Commission of Inquiry into the Application of Nuclear Power in South Africa', appointed in 1956, and reporting in 1960. The Commission focused on the western Cape, and considered the issue from the point of view of future demand, impact on the railway system and coal producers, comparative costs of coal and nuclear energy, and "the distribution of extra costs, if any, of producing power from nuclear energy" (1956-60 Nuclear Power Commission:iii). The Commission included prominent figures in the coal industry, Escom, the railways, and also Roux and Naudé.

During the course of the Inquiry, a significant shift in the institutional nature of the AEB occurred, and the Commission's findings were an afterthought. The shift began by the signing of international nuclear technology co-operation agreements in 1957 with both the UK and USA, which provided for training of South African personnel, the exchange of information on nuclear technology, and the exchange of nuclear materials, which

> "..enabled South Africa to formulate a research and development programme in 1958, in the confidence that it would receive assistance" (Hofmänner 2002:137).

The same year, in spite of a growing hostility towards South Africa within the UN, South Africa became a founder member of the IAEA, with a permanent seat on the board (Henshaw 1989:325).

The key policy shift at the end of the 1950s was the adoption of a South African Nuclear Energy Research Programme in 1958. The choice was made from two options: the first was put forward by Roux, whose suggestion was that the programme be carried out by the Board, and the second was proposed by Naudé, head of the CSIR, who proposed that the programme be based in the CSIR (Hofmänner 2002:130-133). The significance of the choice was the institutional context: on the one hand, a relatively open research environment (the CSIR) more integrated with other

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[56] The heavy water idea came initially from Van Eck, the idea being to utilise the country's cheap electricity prices (Newby-Fraser 1979:34), and it was investigated in the 1950s, but was not further developed.

[57] Newby-Fraser's work is factually detailed but unashamedly partisan, being published by the AEB itself.

research activities; and on the other a closed institutional environment designed for strategic purposes, and not accessible to the general scientific community, or anyone else[58]. The Cabinet opted for the latter. The consequence was, as Hofmänner observes, that:

> "..the AEB managed to get a firm hold of certain aspects relating to nuclear energy research, namely, its contribution to industrial development and national political strategy, and to advance this purpose in the form of scientific research.. ..the course of nuclear energy research would have been different had the national programme been allocated to the CSIR.. ..it seems likely that there would have not been the costs.. ..that have burdened the country through the enrichment and weapons programmes.." (Hofmänner 2002:133).

In other words, the institutional nature of the AEB, with its legislated culture of secrecy, its strategic aspects central to its functions, and the elite network of which key members formed a part, undermined its public scientific or technical character and hastened the adoption of technical-strategic goals heavily conditioned by the geo-political challenges facing the apartheid state, rather than pursuing a trajectory based purely on national development goals. This was done in terms of amendment to the Atomic Energy Act (27/1958, 35/1959), which established the necessary institutional parameters for the development of a research programme, as well as changing the composition of the Board to include Escom, representatives of uranium producers, representatives of industry, and senior bureaucrats from the Departments of Mines and Foreign Affairs (27/1958). At this point, the AEB found premises outside Pretoria and was transformed from a Board which regulated the nuclear industry into a large research and development organisation, and finally an industrial operation employing around 6000 people at its peak in the 1980s.

It was in this context that the Nuclear Power Commission reported its findings, which were negative about the immediate prospects of a nuclear power plant at the Cape, given the impact on the coal industry, the railways (which would both lose business), and the adequacy of current arrangements until the late 1960s (1956-60 Nuclear Power Commission:40). There were two notable conclusions, however: the first recommended that Escom, rather than a local authority or the AEB, build and operate a nuclear plant if one was built, and the second was that

> "..there can be no doubt, however, that the advent of nuclear power in South Africa on an appreciable scale at some future date would certainly provide a stimulus not only to the expanding of existing industries, but to the establishment of new industries capable of applying skills, often of a highly specialised character, to the construction of an atomic power reactor, as well as to the production of the necessary materials and their fabrication into the innumerable components comprised in such a reactor. These industries would include those concerned with all branches of engineering, steel production and metallurgy,

[58] In the end, even the Cabinet were not informed about much of the nuclear establishment's activities.

electronics, chemistry and mining, to mention but a few.." (1956-60 Nuclear Power Commission:41).

The vision contained in this finding is of a large industrial complex, which would link naturally with the existing industrial structure of the country, and exhibit the same synergies existing in the then-emerging MEC; the existing coal-based energy supply paradigm would evolve into a nuclear-based energy supply paradigm, which would have enhanced industrial linkages with the rest of the MEC.

In the light of Escom's apparent reticence, the Commission noted that Escom was obliged in terms of its mandate to continue investigating nuclear power, since the utility was, in terms of the Electricity Act:

> "..charged with the duty to provide a cheap and abundant supply of electricity within the area for which it is licensed, and these comprise most of the heavily industrialised areas of the country. Consequently, [Escom] is under a tacit obligation to investigate all methods of electricity production which might cheapen power supplies and ensure the adequacy thereof within [Escom's] field of responsibility" (1956-60 Nuclear Power Commission:39).

This would be achieved, the Commission noted, through the recently-established Nuclear Power Committee under the auspices of the AEB, which would bring about "co-ordination of research and other activity in the sphere of nuclear power", and which would have amongst its members representatives of Escom, coal producers, the IDC and uranium producers (1956-60 Nuclear Power Commission:39). The Committee continued to meet until Escom's nuclear power commitments in the late 1960s rendered it superfluous.

2) 1960s to 1970s

The 1960s saw the development of a nuclear technology research programme which culminated in a series of decisions in the late 1960s committing the nuclear establishment and Escom to a specific technology path involving uranium enrichment, a weapons programme and a nuclear power programme. The decade began with the ordering of a US research reactor, Safari-1, under the American Atoms for Peace Programme, which was subjected, in terms of a USA-South African agreement, to IAEA safeguards. The decade also began with a significant change in leadership in Escom: Hattingh, who was very sceptical about nuclear power, retired and was replaced by Dr R L Straszacker, who was not only more favourably disposed to nuclear power, but also an acquaintance of Roux, who was appointed head of the AEB at the end of the 1950s; the two were for a time colleagues at Stellenbosch University (Newby-Fraser 1979:37), the intellectual centre of Afrikaner Nationalism. There was also a process of 'Afrikanerisation' inside the AEB, through the exclusion of personnel who were not part of the Nationalist political elite. By the end of the 1960s, almost all senior personnel, and the entire leadership of the AEB

were members of the Broederbond; Straszacker was made a member in 1965, co-incidentally the year of the second and more decisive nuclear power investigation (Wilkins & Strydom 1979, Appendix 1, Interview with A Jackson).

Research and Commitment: Escom and the AEC 1958-1969

Research in the AEB from 1958 to 1969 covered a wide range of nuclear technology-related fields. However, there were two basic lines of technology development which were pursued by the AEB in the 1960s: the development of an indigenous reactor concept, and the development of a uranium enrichment process. From a nuclear power perspective, these two projects were technologically mutually exclusive, and represented the two basic technological approaches to nuclear power; countries such as Canada without access to military-based enrichment facilities had generally opted for natural uranium reactors, whereas countries such as the US, the UK and France, which had invested in weapons-related enrichment plants, opted for enriched uranium reactors. The technology choice in South Africa was overlaid by a strategic concern for self-sufficiency, which grew stronger as international pressure against apartheid increased. The reactor concept, the 'Pelinduna' project, was conceived as a natural uranium reactor moderated by heavy water[59], whereas the enrichment project was premised on construction of an enriched uranium[60] reactor, or nuclear weapons. Both heavy water and enriched uranium require capital- and energy-intensive manufacturing processes, and massive economies of scale, or have to be sourced from countries which have such facilities; concerns with nuclear technology dependence on foreign states became significant in decision-making from the mid-1960s.

The AEB's reasoning for deciding between these two research paths was that the organisation only had the capacity to pursue one of them to the next phase, a pilot plant (Newby-Fraser 1979:125). In reality, there was a more complex decision-making process functioning along several different channels. Technically, the enrichment research was more promising (Interview with W Grant), but in addition to that, two other processes were unfolding. The first was the enrichment process itself, and the second was a decision-making process concerning the establishment of a nuclear power programme The second process was relatively open (by AEB standards), and engaged Escom and others, whereas the first was highly secretive, and research and decision-making was not extended beyond the immediate programme, a few trusted intermediaries such as Van Eck, and the Prime Minister and a select few other ministers. The enrichment research and development process can be termed the "inner core" of decision-making

[59] Heavy water has the same chemical composition as normal water, but the hydrogen atoms are deuterium, an isotope of hydrogen which contains a proton and a neutron in its nucleus (rather than just a proton).

[60] Natural uranium consists of two isotopes: primarily of U_{238}, with less than a percent of U_{235}. Enrichment is the process whereby the percentage of U_{235} is increased, a little for nuclear fuel (3-4%) and a lot for nuclear weapons (90-95%).

and development at the AEB, whereas the relationship with Escom, and involvement with reactor choice constituted an "outer core", which lagged behind decisions made in the "inner core" by a few years.

The enrichment research programme was initiated in 1961, and conducted in an atmosphere of complete secrecy, initially in a laboratory hidden behind the façade of a motor workshop in Pretoria. The programme required significant extra funds in 1963 and in 1966, which were obtained by direct meetings between Roux, his colleagues and the Prime Ministers of the time. Other complementary research programmes such as uranium processing were continued, but the rest gradually shut down (Hoffmänner 2002:143-144). By 1966, the organisation was focused primarily on enrichment and related research avenues aimed ultimately at manufacturing enriched nuclear fuel[61]; Hofmänner argues convincingly that this focus was inherent in Roux's original research proposal in 1958 (Hofmänner 2002:145). The announcement made by Roux in 1966 that other research avenues would be shut down was followed by a request to Cabinet for funding which was an order of magnitude greater than had been provided in the past, in order to construct a pilot plant. This development also represented another institutional shift: the AEB was changing from a research organisation to a proto-industrial complex. In 1967, a new Atomic Energy Act (90/1967) was passed to facilitate this transformation, which enabled the Board to incur loans which would be guaranteed by the state, and tightened the regulation of nuclear installations, which up to then had only consisted of uranium processing facilities.

In order to persuade government to commit itself to funding the pilot enrichment plant, a "highly classified" report was compiled by Van Eck (and a small committee of 'independent' experts) for the AEB on the enrichment programme:

> "..to draft an independent [sic] recommendation to the Cabinet regarding the future prosecution of uranium enrichment in South Africa" (Newby-Fraser 1979:100),

and to persuade them to spend public money on it, and found that

> "..the South African process could be developed in a large-scale plant which would compare favourably with existing plants elsewhere in terms of both capital and operating costs" (Newby-Fraser 1979:101).

The report was handed to the Minister of Mines by Van Eck personally. As a result, the Cabinet approved funds for a pilot enrichment plant in 1969.

The decision process surrounding a potential nuclear power programme essentially involved a process of engagement with Escom, which began formally, as indicated above, with the establishment of a Nuclear Power Committee in 1960. Escom had also contributed R500 000 (R17 million in 2000 rands) to the first five-year programme of the AEB under pressure from the

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[61] This included highly-enriched uranium for the SAFARI reactor, as well as for nuclear explosives.

government (Conradie & Messerschmidt 2000:196), and were asked to contribute R2.5 million (around R80 million in 2000 rands) to the second programme (from 1963-7), which required a change to the Electricity Act (33/1963), allowing Escom to "undertake research". The nuclear establishment had expedited the Nuclear Installations (Licensing and Security) Act (43/1963) in preparation for the licensing of nuclear power plants, which placed Escom under a considerable amount of pressure (which was probably the AEB's intention).

On the one hand, the Electricity Act effectively prevented Escom from investing in power plants which were not the most economical available, and their position was that if they were forced into investing in a nuclear plant, the state should subsidise the difference between the cost of nuclear electricity and the cheapest alternative (Conradie & Messerschmidt 2000:197). On the other hand, the utility had recently been granted an effective monopoly on the construction of new electricity plants, which they might lose in the event of a large nuclear power programme, since legally the AEB had sole jurisdiction over the construction and operation of nuclear plants, and could licence a local authority[62] or other producer to produce nuclear power. The jurisdiction question was resolved through Clause 4 of the 1967 Atomic Energy Act (90/1967), which compelled the AEB to refuse an application to build a power plant anywhere that Escom wanted to build one; if Escom did wish to do this, Escom would,

> "..in collaboration with the [AEB] and within a period agreed on by the [AEB], undertake the construction of the necessary plant, and [Escom] shall thereafter operate such a plant..".
> (Clause 4, Atomic Energy Act (90/1967)),

which was clearly designed by the AEB to increase pressure on Escom to make a commitment to a nuclear power programme.

Other types of pressure were put on Escom from the mid-1960s. Straszacker was made a member of the Broederbond in 1965, and the Minister of Mines commissioned a study from the AEB on the "..Possible Introduction of Nuclear Power in South Africa" in the same year, which reported in 1968. The task of carrying out the investigation was handed to the Nuclear Power Committee, which at the time was chaired by Van Eck and included members from the AEB, uranium producers and Eskom. The work of the Committee was directed to a much smaller sub-committee headed by Van Eck, and comprising only members from Eskom, the AEB, the railways, Genmin and two other government representatives. The report was (unsurprisingly) unequivocally in favour of nuclear power being introduced into the South African electricity system at various time intervals, mainly on the coast, in the context of the planned national grid,

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[62] The Cape Town municipality had begun to speculate on the possibility of constructing its own nuclear power plant (Financial Mail 4/6/1965), while Escom was eager to prevent the construction of any new municipal generation plant. Eskom had what amounted to an informal veto on new municipal plants by the 1960s, but in the case of a nuclear power plant, political pressure from the AEB would have circumvented this veto.

and some of the key arguments of the report were framed in terms of national resource strategies (the extent and projected use of coal reserves), which were only developed in mainstream institutions from 1968 onwards. The report began to use computer-based planning methodologies which would become standard parts of the AEB's pro-nuclear arsenal, and were probably the first instance of an application of integrated resource planning in the country[63] (Nuclear Power Committee 1968:18-34):

> "..[the] expected steady introduction of nuclear power will gradually reduce the rate of increase in demand for coal for electrification. More coal will become available as a source of liquid fuels and chemicals, and the lifetime of the country's coal reserves will be considerably extended" (Nuclear Power Committee 1968 Summary:5)[64].

The other two key areas of the report were an analysis of what kind of reactor would be suitable for South Africa, and the outline of "a tentative programme for the introduction of nuclear power stations in South Africa" (Nuclear Power Committee 1968:47-48). Only 'economically proven' reactors would be considered, which ruled out the AEB's reactor. The report was clear that:

> "..because the continued and assured supply of ENRICHED uranium for a power reactor in this country is at present subject to grave doubts, only those types of power reactors capable of operating on a feed of natural uranium can be considered at the present time" (Nuclear Power Committee 1968:50).

Enriched uranium reactors would only be considered if

> "..at the time of placing the order, the uncertainties regarding an assured supply of enriched fuel have been resolved" (Nuclear Power Committee 1968:50).

Again, the western Cape was the only economical candidate for a nuclear power plant; the most promising technology was the CANDU[65] reactor. The summary report further noted that

> "South Africa could consider building her own enrichment plant, but.. ..it was considered unlikely that this country could contemplate either such vast capital expenditure, or the requisite enormous technical effort, in the near future" (Nuclear Power Committee 1968 Summary:1).

The report on nuclear power, and the secret report on funding the enrichment programme, reached the Minister's desk at around the same time.

The nuclear establishment successfully used the western Cape power debate to goad Escom into a commitment: in 1967, Jan Haak, the Minister of Mines[66] announced that government had purchased Duinefontein, the future site of the Koeberg plant (Financial Mail 11/8/1967), which

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[63] In the 1970s, the AEB used energy modelling techniques, including MARKAL, the IEA's energy model, to demonstrate the feasibility of a large nuclear power programme, at the same time as similar models were being developed in other government agencies for different purposes (AEB Annual Reports).

[64] Van Eck was during this period simultaneously advising the Cabinet on strategic responses to the growing oil embargo.

[65] A natural uranium-fuelled, heavy water-moderated Canadian reactor; the most feasible of the then available natural uranium reactors.

[66] A key point is that the Minister of Mines was the AEB's line minister, not Escom's.

had been identified as a suitable nuclear site by AEB personnel (Escom lacked any expertise in nuclear power at the time). Contrary to official Escom accounts, clearly Escom was not involved in this decision; however, it did force Escom's hand, and in June 1967,

> "..out of the blue, Escom wrote to the Council asking for a joint discussion on the building of a nuclear power station in the Western Cape.." (Financial Mail 11/8/1967).

The key point, however, was in 1969, when in response to the nuclear power report, Jan Haak, now Minister of Economic Affairs[67], announced that the government would embark on a programme of building three nuclear power plants; one in the western Cape, one in the eastern Cape, and one in Natal (Financial Mail 28/3/1969); he made his comments at a conference at Potchefstroom University titled "Energy for the next Century", and placed them in an energy context, based on the recent revisions of South African coal reserves (in the recently-released CAB report). Since it seemed coal would now run out sooner than expected, "..that leaves only atomic power to carry the bulk of the burden" (Financial Mail 28/3/1969). Haak's announcement was elaborated to the media by Roux; Escom was not represented. The report concluded optimistically that:

> "Escom needs to build up its generating capacity from its present 7000 MW to 62 000 MW by the turn of the century, and when new power stations are added, they will almost certainly be nuclear" (Financial Mail 28/3/1969).

This initiative by the AEB almost certainly forced Escom's hand; in 1969, two key developments signalled Escom's definite commitment to a nuclear programme. The first was a protocol agreed between Escom and the AEB concerning jurisdiction in the nuclear power sphere in September 1969, whereby Escom would build and operate nuclear power plants, and the AEB would license them to international standards, via a new division which later developed into the Council for Nuclear Safety (Newby-Fraser 1979:128). At around the same time, Escom set up its own Nuclear Power Engineering Division in its Mechanical Engineering Department, which was, according to the 1969 Escom Annual Report, an outcome of the 1968 Report from the AEB's Nuclear Power Committee (Escom Annual Report 1969:19-20). The Division leader was a long-standing AEB staff member who had been centrally involved in the Nuclear Power Committee and its Report (Eskom 1996:34); the rest of the staff were recruited from the UK, from either civilian or nuclear submarine projects (Eskom 1996:64). The strong position that the 1968 Report took on natural uranium reactors and investment in enrichment facilities was rapidly overturned by a series of investigations by Escom's nuclear division, which settled on an enriched uranium reactor by 1969 (Eskom 1996:34). This resulted from a combination of techno-economic reasoning from Escom engineers (most of whom were familiar with enriched uranium

[67] Escom's line minister.

reactors), and strategic reasoning from the nuclear establishment and the state, which were keen to promote enrichment technology, to deploy a prominent civilian application, and to be reassured that South Africa could potentially be independent in its fuel requirements if necessary.

After the commitment in principle to a nuclear power programme, Escom's nuclear division embarked on a decision-making process to choose a reactor model and appoint a contractor on a turn-key basis to construct the plant. The process was partly based on technology (operating performance), and partly on geopolitical factors: contractors (and associated technology) based in the US and certain other states were avoided because of the threat of nuclear sanctions, which forced Escom to abandon their commitment to their first technological choice, the Boiling Water Reactor (BWR). Finally in 1976, a contract was signed with a French consortium to construct two PWRs of around 900 MW each at Koeberg, as well as a safeguard agreement for the power plant, to which the South African and French governments and the IAEA were signatories (Eskom 1996:37); the deal included an R800 million export credit agreement with French banks (Financial Mail 17/12/1976). The construction process was delayed by sabotage by ANC guerrillas in the early 1980s, which delayed the commissioning of the plants by around a year. The first unit was commissioned in 1984, and the second in 1985. In spite of nuclear sanctions, Escom formed a close and enduring technical relationship with both the Framatome consortium and the French national utility EdF, which was partly facilitated by a secret[68] training process organised by EdF to train South African operators in the 1970s: Eskom's official history states that

> "Koeberg is above all a French plant, and EdF always regarded its two units as an extension of its own 36 units of similar design.." (Conradie & Messerschmidt 2000:213).

A significant question is whether Escom planned to construct more nuclear plants; this to a large extent defined the landscape on which nuclear policy decisions were made. At the beginning of the 1970s, it was commonly asserted by South African politicians that by the end of the century there would be up to 20 000MW of installed nuclear generating capacity; a 1975 report in the Natal Mercury claimed that

> "..events are changing the energy picture so quickly that the already ambitious nuclear power programme mapped out for South Africa may prove too conservative" (Natal Mercury 16/10/1975),

citing an unnamed government report which claimed that by 2000, of a total installed capacity of 64450 MW, 15 000 would be nuclear. The basis for these projections was an energy scenario

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[68] This was necessary to avoid anti-apartheid protestors in France, where the training took place, who threatened to disrupt the training process.

vigorously promoted by the nuclear establishment, based on the new coal reserves paradigm pioneered by Van Rensburg in the CAB report, who stated in 1975 that "..based on present usage concepts, South Africa will have to develop coal alternatives by 1990" (quoted in Financial Mail 5/3/1976), which in turn was based on electricity demand growth rates of the early 1970s. This was a view endorsed in 1977 by Jan Smith, then general manager of Escom and chairman in the early 1980s:

> "..a series of large nuclear power stations dotting South Africa's coastline have been predicted by Mr Jan Smith, general manager of Escom" (The Argus 14/7/1977).

The practical timetable for the ordering of these nuclear stations, given Escom's existing programme, would have been from 1983 onwards. By late 1977, however, it became apparent that nuclear sanctions would make fuel procurement extremely difficult; by 1979, the Prime Minister had ordered the AEB to go ahead with a fuel cycle with only enough capacity to supply Koeberg, and by 1983, it was clear that new capacity would not be required for over a decade; by 1990 it was clear that new capacity would probably not be required until 2005. During this period, the post-coal vision was maintained but pushed back until 2050: Eskom's deputy engineering manager stated in 1990 that

> "..in all the planning done by Eskom and the AEC, a progressive changeover to nuclear power would have to occur some time towards the middle of the next century" (quoted in Financial Mail 13/4/1990).

A submission to the Nuclear Fuel Cycle Initiative by Eskom in 1995 indicated that it had no plans to order another nuclear power plant "within the next 25 to 30 years" or even after this (Nuclear Fuel Cycle Initiative Working Group 1995:5). Thus, by 1990, no nuclear expansion was contemplated for the foreseeable future.

In the 1970s, a short- or medium-term switch to nuclear power was driven by several factors: a) continued high electricity demand growth; b) a medium-term coal scarcity scenario; and c) the availability of nuclear fuel (either imported or locally-produced). This trio of rationales collapsed by the end of the 1970s; government support for further nuclear plants disappeared in 1978, when the strategic problems associated with nuclear sanctions began to emerge, and the nuclear establishment was locked into commitment to a purely strategic fuel cycle with no spare capacity.

Enrichment, Nuclear Fuel and Nuclear Weapons – the 1970s

The 1960s had ended for the nuclear establishment with political approval and backing for both the pilot enrichment plant and nuclear power. Once the technologies had been demonstrated to be viable, their ambition was to develop a 'nuclear-industrial complex', at the heart of which would be a large-scale enrichment plant, which would enrich South African-produced (and

imported) uranium both for local use and for export. In 1970, only four countries in the world possessed nuclear enrichment capabilities (the US, UK, France and the USSR); the South African Prime Minister announced in parliament in July of that year that South Africa was about to join this exclusive club. He gave as the two primary reasons for developing an indigenous enrichment programme the desire to beneficiate South African uranium, and thus add value to South African exports, and that:

> "South Africa finds itself on the eve of a large nuclear power programme of its own – of the order of 20 000 MW (electrical) by the end of the century. If such a programme can be based on enriched uranium, it will result in a very marked capital saving. However, such a course can only be followed if the supply of enriched uranium can be guaranteed, which, in the difficult world in which we live, implies own production." (quoted in Newby-Fraser 1979:92).

Escom's plans at the time only involved building a plant of around 350MW. The Prime Minister also expressed his reluctance to agree to any international non-proliferation safeguards which would compromise the secrecy of South Africa's 'unique process', and stressed that South Africa's "..research and development programme in the field of nuclear energy is directed entirely towards peaceful purposes" (quoted in Newby-Fraser 1979:94). Following the Prime Minister's address, the Minister of Mines introduced a bill to establish a separate organisational entity to house the enrichment programme, passed as the Uranium Enrichment Act (33/1970). The purpose of the Act was to establish a Uranium Enrichment Corporation (Ucor[69]), funded by the state via the state's purchase of 'shares' and exempt from any provisions of the Companies Act, to house all the enrichment-related activities and assets of the AEB. The motivation for this separation was in part commercial, since the beginning of the 1970s saw the beginning of a nuclear power boom, and expectations were that world demand for nuclear fuel would soar. However, the biggest reason was institutional; Waldo Stumpf, later CEO of the AEC commented that:

> "The old AEB was very much seen as a high-tech research organisation; no strategic projects, and that was one reason why the enrichment project was taken out of it – the thought at that point was that it would confuse some of the thinking inside the organisation" (Interview with W Stumpf).

Thus the purpose of Ucor during the 1970s and early 1980s was to house 'strategic' projects, including the pilot enrichment plant, nuclear explosives and weapons research, and feasibility studies on the development of a large-scale enrichment plant, which effectively separated the core activity of the AEB from the rest of the organisation. The organisation had two key areas of

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[69] Since the AEB and Ucor essentially had a shared leadership structure, unless Ucor is referred to specifically, references to the AEB from here on will be assumed to include Ucor.

activity during the 1970s: the development of the pilot enrichment programme, and the development of nuclear explosives. A third was added at the end of the 1970s in the form of the scaled-up enrichment plant and linked processing plants, the aims of which were to produce fuel for Koeberg.

The enrichment programme in the 1970s was focused on the development of the South African enrichment technology. This took several forms: the first was the design, construction and testing of the Y-Plant, the small-scale pilot enrichment plant, which was completed in the late 1970s and produced the first highly-enriched uranium (HEU) in 1979; the second was a series of activities aimed at getting political commitment to the *grand projet* of the nuclear establishment, a large-scale enrichment plant, which involved a combination of publicity (a break with tradition for the nuclear establishment), international liaison and negotiations, and lobbying; and the third, at the end of the 1970s, was the development of a scaled-down 'semi-commercial' plant.

The Y-plant's central function, other than to test the enrichment technology, was to produce raw material for the weapons programme: 85% of its capacity was used to produce HEU for weapons manufacture, and 15% was used to produce nuclear fuel for the SAFARI-1 research reactor, which required 85% enriched uranium (Interview with W Stumpf; Liberman 2001:55). It did this from around 1979 to 1990, when it was eventually shut down as part of the weapons decommissioning programme.

The process of developing the enrichment process, and the Y-plant, was interspersed with a decision-making process which resulted in the manufacture of six small nuclear weapons[70]. Stumpf described the programme as "..a very small programme as far as this organisation was concerned.." (Interview with W Stumpf), which was partly a reference to the small budget of the programme compared to later projects, and partly a reflection of the limited role of the nuclear establishment in the programme, which was taken over by Armscor in the late 1970s. The Y-plant was not however a 'small' expense, involving a capital expenditure of R2.7 billion (2000 rands), plus a significant additional cost for operating expenditure (after Auf Der Heyde 1993:24). There is some controversy about the date of the actual decision to develop nuclear weapons (Liberman 2001:49); however the debate is clouded by some confusion surrounding the distinction between nuclear explosives and nuclear weapons and their concomitant policy contexts.

[70] The weapons programme will be considered here only insofar as it impacted on energy policy-related decisions, of which the key remaining decision was the decision to develop the full fuel cycle in the late 1970s. Liberman (2001) provides an excellent account and analysis of the whole programme, and particularly the less-researched military aspects of the programme in the 1980s.

Permission was given by the Minister of Mines in 1971 to begin a secret research programme on nuclear explosives, possibly utilising skills from the terminated reactor projects[71], although engineers working on the Y-Plant design reported in interviews that the specifications given to the plant's designers in 1969 were for a plant which would enrich uranium to at least 80%:

> "I was the designer – I was given the instruction to do a process design of a plant to produce 80% enriched material – now, from that moment, I assumed that it was a weapons-grade plant, that's what we designed for" (Interview with A Jackson).

This specification came from the secret committee headed by Van Eck which reported to Cabinet on the project in 1968. Van Eck was apparently seriously interested in using nuclear explosives for engineering purposes. Two applications were considered: one was excavating a new harbour near Port Nolloth, and another was the creation of crude oil storage tanks underground[72] (Interview with W Grant); it thus seems that top nuclear and government bureaucrats considered the possibility of nuclear explosives from the late 1960s, and included it in their specifications for the plant. Thus, what was constant from the late 1960s was the intention of the nuclear establishment to develop nuclear explosives. What changed was the policy context in which this programme was situated.

In 1974, Vorster gave the go-ahead to develop 'Peaceful Nuclear Explosives': since the first HEU was only produced in 1979, this research was entirely theoretical[73]. The decision to develop nuclear weapons seems to have been taken much later. Interviews indicate that the initiative came from within Ucor in around 1976, when the technical basis for both enrichment and explosives had been established; the weapons option was presented by Ucor to government at around this time (Interviews with W Grant, A Jackson, W Stumpf). The decision to develop deliverable nuclear weapons was apparently thus only taken sometime in 1977, when the PNE[74] programme was stopped, and effort was transferred to military applications. From a policy point of view these decisions were confined to the nuclear establishment, the Prime Minister and one or two ministers. The military establishment was apparently only made aware of the existence of the nuclear weapons programme in 1974, when the AEB requested the use of a remote weapons testing range in the Kalahari desert, for a potential nuclear explosives test (Liberman 2001:52), and were only marginally involved in a technical capacity until 1978, when P.W. Botha succeeded Vorster as Prime Minister. At that point, the weapons programme was taken out of a

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[71] Reactor physics and the physics of nuclear explosions are similar; thus reactor physicists can easily transfer their skills to nuclear explosives research. It is quite possible that the AEB/AEC managed the flow of skills from one activity to the other to preserve a skills base within the organisation, until the late 1980s, when this became unsustainable (Hofmänner, personal communication)

[72] Van Eck was also at the time (1965-70) in charge of an IDC/Sasol process of building up a strategic oil reserve, which included storing large amounts of crude oil.

[73] Since no nuclear explosive tests were carried out by the apartheid state, in a sense all explosive development was 'theoretical'.

[74] Peaceful Nuclear Explosives – in theory (abandoned after the 1970s) nuclear explosives could be used for large civil engineering projects, such as creating new harbours.

purely nuclear policy context, and placed in a broader strategic context (which will be discussed below); until then, the weapons programme did not have any strategic *raison d'etre*, and was purely an outcome of the technical ambitions of key nuclear personnel combined with the allure that the prestige of nuclear weapons status exercised on the tiny group of political decision-makers involved.

Large-scale enrichment plant proposals were developed after initial successes with the South African enrichment process in the late 1960s and early 1970s. The scale of the proposed project (both in terms of funding and policy) required broader political support than previous developments; also, the nuclear establishment's most prominent and influential supporter, Van Eck, had died in the early 1970s. This requirement resulted in three interrelated strategies. The first was to develop a multi-dimensional policy context for the project: this was done by emphasising two aspects of the project. The first aspect was its potential to supply South Africa with strategically secure nuclear fuel, which would only be required if it was necessary for the country to embark on a large nuclear power programme: to this end, the AEB developed its own energy modelling capacity. The second aspect was to place the project in a minerals beneficiation context: the project would potentially earn huge amounts of foreign exchange by beneficiating South African-produced uranium. Added to this was the second strategy, which was to achieve international validation for the technology, and if possible, international investor interest. In the mid-1970s, Roux and Grant presented papers on the South African process to several international fora (Roux & Grant 1975), and interested a German nuclear technology firm in undertaking a techno-economic study in collaboration with Ucor in anticipation of a joint venture. The third strategy was to launch a publicity offensive in the local media, which, although this was new territory for the traditionally secretive nuclear establishment, Roux undertook brilliantly.

The techno-economic study was based around a 5000tSWU/a plant (Interviews with Ucor engineers). The South African process was very energy-intensive by comparison to other processes, but capital costs were significantly lower; thus the process was potentially competitive in an environment where capital was relatively scarce but electricity was extremely cheap (South Africa in the early 1970s). The proposed plant was thus premised on the same kind of economic linkages which had characterised most South African industrial development in the 1960s and 1970s: raw material from the gold-coal complex (uranium and electricity), and the product partly exported and partly supporting the expansion of the electricity system through fuel supply and

through boosting electricity demand[75]. A 5000tSWU/a or 7000tSWU/a plant would have required a higher annual feedstock of uranium than South Africa's contemporary production capacity (Financial Mail 28/6/1973), which would either require a significant increase in production infrastructure, or importing a considerable quantity each year. The capital cost of a 5000t/a plant was estimated at R650 million (R13.3 billion in 2000 rands), and it would produce enough fuel for 50 GW of nuclear generating capacity[76]. Given electricity growth rates in the 1970s (as well as the huge increase in capacity required to provide electricity to the plant) and a sizeable nuclear programme, South Africa could have consumed half of this annually by 2010; thus an export industry would have formed a significant component of the project. The plant would have boosted electricity demand considerably, and would have required between 15 000 and 30 000 GWh of electricity per annum, which would have required between 2300 and 4500 MW of additional baseload capacity. This would have been required between 1980 and 1985, when total installed capacity was between 18 000 (1980) and 25 000 MW (1985) on Escom's system[77]. Thus, the implications for South Africa's industrial system were considerable.

From around 1973, there were a string of optimistic announcements, usually by the relevant Minister, on the progress and prospects of the South African enrichment process, which was nevertheless shrouded in official secrecy, to which was added another layer of commercial secrecy, since it was made clear that there was a significant danger of industrial espionage. In 1973, government announced that

> "..progress at a R50 million[78]-plus pilot plant.. ..was encouraging enough to warrant preparations for a full-scale plant" (Financial Mail 28/6/1974).

Piet Koornhof, Minister of Mines, announced in 1974 that the South African enrichment process "would be more valuable to South Africa than the discovery of diamonds"[79] (Financial Mail 28/6/1974). In a press release, Koornhof announced in 1975 that:

> "..South Africa, as one of the few large uranium producers of the free world .. ..can make an extremely important contribution.. ..to assist in relieving the energy problems with which the world is faced.. ..By the commercial application of its enrichment process, which promises to be competitive with existing processes, and by marketing at least a part of its uranium in its most refined form as enriched uranium, South Africa will be able to extend this contribution

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[75] Enrichment is very electricity-intensive: for instance, the Tricastin nuclear industrial complex in France has four dedicated reactors together rated at 3000 MW(e), which mainly provide electricity for a 10 800 tSWU/a enrichment plant. In South Africa, in 1993, the AEC used ¼ of Koeberg's output, mainly for their enrichment process.

[76] Estimated from (http://www.uic.com.au/nip33.htm); a rule of thumb in the nuclear industry is that roughly 100 000kgSWU are required per year for a 900 MW reactor (Interview with A Jackson)

[77] These calculations are based on the following assumptions: the enrichment plant would use the South African technique, which would have a minimum electricity consumption between 3000 and 6000 kWh/SWU. The generating plant would run 80% of the time.

[78] R1.02 billion in 2000 rands.

[79] The discovery of diamonds in the 1870s signalled the beginning of South Africa's modern economic development – the allusion was meant to imply an event of equal significance.

significantly and such a step will be of exceptional value to the scientific, technological and industrial development of the country. Furthermore, it will enable the Republic, in due course, to itself produce the enriched uranium required for its own nuclear programme, rather than becoming dependent, in an unstable world, on foreign sources for its requirements. There can be no doubt that South Africa can develop its enrichment process further.. ..the Government has consequently decided that the construction of a commercial enrichment plant, to which it will give its full support, is to be proceeded with, but that a decision on the size of the plant will only be taken in 1978.. ..It is envisaged that the plant will come into operation in 1984 with full production in 1986" (Press Release on a Commercial Uranium Enrichment Plant in South Africa, by Dr The Honourable P.G.J. Koornhof, Minister of Mines).

The Sunday Tribune reported that

> "..the Government has also made known that the uranium enrichment process could earn South Africa about R250-million a year in foreign exchange" (Sunday Tribune 27/7/1975).

The Financial Mail, in the same year, speculated that

> "..European interests may well be negotiating with South Africa at this moment to set up an international consortium based on South African technology.." (Financial Mail 11/4/1975)[80].

Koornhof announced in parliament in June 1975 that the government had created a subsidiary company to house such investment called ISASA[81], but the only recorded shareholders were Ucor and the IDC. The aim was to attract local shareholding as well so as to

> "..make the first commercial enrichment plant in South Africa a venture in which a large segment of the South African economy will have a direct or indirect interest" (Barclays National Review, March 1976 (no page numbers)).

The last in a series of very enthusiastic articles on South Africa's enrichment programme, from 1974 to 1976, was an interview with Roux, in which he claimed that feasibility studies

> "..reinforce our original conclusion that an enrichment plant, based on the Ucor process, will be economically sound and competitive with overseas plants" (quoted in Financial Mail 17/12/1976).

The 1975 AEB Annual Report declared that the government had decided to go ahead with the large-scale plant, subject to a final decision on its scale in 1978 (Atomic Energy Board Annual Report 1975:4). However, between 1976 and 1978, a number of developments militated against the project. International interest faded away, primarily because of increasing international isolation of South Africa and its nuclear establishment due to apartheid, as well as because the mid-1970s rises in the electricity price rendered the energy-intensive South African process far less economically attractive. A large-scale nuclear power programme did not materialise, and

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[80] This was partly true.
[81] The Isotope Separation Association of South Africa.

less-risky, less capital-intensive export-oriented programmes were underway, including coal and steel. In addition, there was a new scarcity of capital due both to a 1977 recession, political obstacles to foreign capital markets, and competition from other mega-projects such as power plants (including Koeberg), coal mines, armaments and the Sasol projects. Media reports suggest that the project would have cost R2 billion (R23.8 billion[82] in 2000 rands) or more (Financial Mail 17/2/1978).

In 1978, government announced a radically scaled-back enrichment programme. The press was noticeably disappointed (stories had headlines like "Ucor's climbdown" (Financial Mail) and "Uranium: the drastic changes" (Sunday Tribune)).

> "To curtail a project which could have earned over R250 million a year in foreign exchange and established South Africa as a major enriched uranium supplier, must have been a painful decision",

reported the Financial Mail (Financial Mail 17/2/1978), which was a testament to the nuclear establishment's success in the mid-1970s in promoting the project, which had not progressed beyond a techno-economic study. The lack of any reference to the project in the state's Economic Development Plans would seem to indicate that the state's planning agencies took the project less seriously than the media did.

The End of International Co-operation

Since the 1960s, international pressure had been mounting against apartheid in international fora, including the IAEA. Since South Africa was a founder member of a relatively small club of nuclear nations and also had a protected status as a uranium supplier to the UK and the US, it was protected in this context from international pressure until the 1970s, when outspokenly anti-apartheid states such as India became members. The 1976 uprising heightened international political pressure against South Africa. In the nuclear sphere, both South Africa's acknowledgement that it had developed an enrichment process, and its refusal to sign the NPT or subject its nuclear facilities[83] to IAEA inspections raised suspicions that it was developing nuclear weapons.

The watershed came in 1977, when South Africa appeared to be making preparations for a nuclear test in the Kalahari[84] (which in fact it was), which provoked a massive outcry from the world community, and South Africa's allies in particular; the tests were quietly shelved and assurances were given to a sceptical international nuclear community that South Africa had no intention of building or testing nuclear weapons. Nevertheless, South Africa lost its seat on the

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[82] The Z-Plant cost around R2.7 billion in 2000 rands (Auf Der Heyde 1993).
[83] Apart from Koeberg and the SAFARI research reactor.
[84] These were detected by a Soviet spy satellite.

IAEA's Board of Governors in 1977 (Liberman 2001:69), which was a serious blow to the prestige of the South African nuclear establishment; since the state had no independent nuclear policy capacity, South Africa's prominent role in international nuclear affairs had bolstered their credibility considerably. South Africa's exclusion also possessed ideological significance for the South African state: first because the IAEA was probably the last significant forum in which South Africa was a legitimate participant, and second, because the prestige of South Africa's nuclear technology capabilities was central to the peculiar brand of technocratic modernism espoused by the apartheid state.

The most significant practical outcome was the US Nuclear Non-Proliferation Act, passed in 1978, which banned any technological collaboration or nuclear trade between the US and non-NPT-compliant states. This formed part of a larger package of nuclear sanctions against South Africa, which not only prevented South Africa sourcing nuclear fuel from the US, but also placed pressure on its European allies to follow suit, which threatened to deprive Koeberg of fuel. This international nuclear isolation heralded a new period in South African nuclear policy.

3) 1978 to 1988

The most significant developments in nuclear policy in the late 1970s were tied to a change in national political leadership in 1978, which saw the accession to power of P.W. Botha, formerly Minister of Defence. Botha embarked on a reorganisation of government, which brought about two significant changes: first, Cabinet ministers had less autonomy; and second, a 'presidential' process of policy co-ordination based on four permanent cabinet committees, one of which dealt with economic issues, which centralised and co-ordinated economic and industrial policy (O'Meara 1996:278, Davenport 1987:438). Since nuclear policy was determined by a tiny political and technocratic elite, these changes had a significant impact on policy outcomes.

The first significant change was that Botha took control of the nuclear weapons programme, which up to then had been managed entirely by the nuclear establishment, and placed it into a broader, military-dominated policy environment. Botha assembled a secret high-level committee (the Witvlei Committee) consisting of Botha, the Ministers of Defence, Foreign Affairs, Mines, Finance and Armscor, the AEB and the South African Defence Force, which was given the responsibility of determining whether nuclear weapons had strategic value for the country, and if so, to develop a policy framework consisting of a programme for their development and a strategic framework for their potential use. The committee recommended in 1979 that deliverable nuclear devices be constructed as a "credible deterrent" and that overall responsibility for the programme be moved to Armscor, which had some expertise in designing actual weapons systems (Liberman 2001:53). From the late 1970s the programme was based in

an Armscor facility on the AEB site, and the nuclear establishment's role in the programme was limited to producing weapons-grade uranium, providing additional nuclear technology, theoretical work on more advanced nuclear devices, and the Erika reactor project[85], the aim of which was to develop an indigenous PWR which could also be used for plutonium production, and to test fuel assemblies for Koeberg (Hofmänner 2002:155,159). Further development of the weapons programme was halted by PW Botha in 1985, mainly because it would not increase the programme's strategic utility, since it was practically no more than a "diplomatic deterrent" (Liberman 2001:59).

The second significant change which Botha brought about in the nuclear establishment was a change in leadership: the nuclear establishment's programme had up to then been masterminded by two people: Roux, and Dr W.L. Grant[86], a brilliant engineer who had pioneered all the major research projects in the AEB and Ucor, notably including nuclear explosives and enrichment, and was a single-minded proponent of nuclear technology. He, Roux and Van Eck formed the ideological core of the 1960s and 70s nuclear establishment's vision of a nuclear industrial complex in South Africa. Roux was encouraged to retire, which he did, and Grant, at the time general manager of Ucor, was sidelined in favour of Dr J.W.L. De Villiers, Grant's deputy at Ucor. De Villiers was well-connected with the new political leadership, and in particular with the new Minister of Mines, F.W. De Klerk. Whereas Roux, and Grant in particular, were nuclear fundamentalists, De Villiers was regarded by the fundamentalists as being a sceptic (Interviews with W Grant, A Jackson), less prone to grandiose visions for nuclear power in South Africa, and more attuned to the strategic requirements of the new political elite. His appointment coincided with a shift in organisational culture in the nuclear establishment from a pioneering research culture to that of a strategic-industrial complex with more limited goals.

Whereas previous ministers had been the nuclear establishment's chief public spokespersons, De Klerk and his successors were more cautious, which the old guard found frustrating:

> "The minister of mines at the time was De Klerk.. ..he was the most incompetent minister I'd ever had, and I've had many of them. He just could not decide. People were sitting there; "should we go?", and they said, "he's still thinking", and he takes three months to think.. ..I'm sorry, I do not think Mr De Klerk was a very good administrator. He was nowhere near as good as Piet Koornhof[87], who was also our minister. Ou Piet was a nice minister! Ou Piet would come to you, and he said, "now what do you think?". I said, "well, I think it will

[85] This came to nothing, since neither Armscor nor Eskom were interested in the project; however, engineers who had worked on the project were later instrumental in developing the PBMR project (Hofmänner 2002:155).

[86] In addition to being a brilliant nuclear engineer who was well-known in international nuclear circles, he was also a single-minded proponent of apartheid, and attributed its demise to "white selfishness" (Interview).

[87] Koornhof had been the responsible minister in the early to mid-1970s, and had been a vociferous supporter of the nuclear establishment's ambitions (see above).

work" – he says, "right, sign!" We got going very fast when Piet was boss.." (Interview with W Grant).

A 'nice' minister meant a co-operative minister, who gave the nuclear establishment *carte blanche* and did not resort to a broader decision-making process; under the Botha regime, nuclear policy was subjected to closer scrutiny, and more integrated into strategic context. The leadership change was linked to a longer process of restructuring involving the institutional transformation of the nuclear establishment, extending the corporate structure of Ucor to the whole organisation. These changes were the result of an inquiry appointed in 1980, chaired by Roux, which resulted in the Nuclear Energy Act (92/1982), which effected three significant changes. The first was a restructuring of Ucor and the AEB, which involved transforming the AEB into a corporate entity (called Nucor), and placing Ucor and Nucor under a new entity, the Atomic Energy Corporation (AEC), which was a new Botha-era entity, representing a corporation in style and concept, but state-owned and exempt from any provision of the Companies Act (or any other legislation) that the Minister saw fit (Clause 18). The second change was an extension of the secrecy provisions contained in previous Acts, and the third was the creation of the Council for Nuclear Safety (see above). The nuclear establishment was again reorganised in 1985; the separate components of the AEC (Nucor and Ucor) were merged into a single organisation (Hofmänner 2002:146), to integrate the fuel production process, which was divided between Ucor (enrichment) and Nucor (conversion and fuel fabrication): fuel production had become the nuclear establishment's core function with the decline in research activities and weapons development in the 1980s.

The decision to go ahead with the development of an indigenous nuclear fuel capability was linked directly to the isolation of the South African nuclear establishment after the 1977 nuclear test fiasco. In the same year, the AEB was directed by government to draw up contingency plans for a fuel production capacity capable of fuelling Koeberg (Auf Der Heyde 1993:38). The final decision was directly related to barriers Escom encountered procuring fuel for Koeberg: Escom's strategy for acquiring nuclear fuel involved several phases. The first phase consisted of an agreement with South African mining conglomerate Gencor[88] in the early 1970s brokered through the Chamber of Mines, whereby Escom would loan Gencor R50 million to finance the opening of a new uranium production operation in exchange for an exclusive supply of uranium at 5% below world prices (Eskom 1996:55) via Nufcor. The second phase involved delivering the uranium to France where it would be converted into UF_6 and transferred to the US, where

[88] Gencor was the only 'Afrikaner' uranium producer.

Escom had concluded a contract with Westinghouse[89] in 1974 to enrich it (Interviews). The third phase consisted of transferring the enriched uranium back to France, where under the 1976 Koeberg contact, Framatome would fabricate the fuel (Eskom 1996: 54-56).

The US began stalling on nuclear fuel-related contracts (both for Escom and for the SAFARI reactor, for which the AEB had a fuel contract with the US) on non-proliferation grounds from around 1975 (Liberman 2001:69), and the 1978 Nuclear Non-Proliferation Act prevented the US Nuclear Regulatory Commission from granting a licence for the export of the enriched uranium; however, Escom was still contractually obliged to supply the uranium (or suffer a stiff penalty clause in their contract with Westinghouse), leaving it trapped in the US. In addition, the US was putting pressure on its allies not to supply nuclear fuel to South Africa, which meant that it would be difficult to source enriched uranium elsewhere. This was the defining event in late 1978 which led directly to P.W. Botha's decision to order the AEB to build the 'Z-Plant', the 'semi-commercial' enrichment plant, and a matching conversion plant with the necessary capacity. A senior engineer in Ucor recalls that, in the wake of the Escom fuel fiasco:

> "P.W. Botha then said, there is *no way that Koeberg is going to close*, because that would be the *pièce de résistance* of the success of sanctions, so he in effect ordered us now to build the Z-plant" (Interview with A Jackson).

Whereas Botha was primarily responsible for the Z-Plant decision, and guaranteed that Escom would buy all its output, Escom itself requested the AEB to build a fuel fabrication plant, and partially financed it (providing just under half the capital) at around the same time:

> "Escom probably had a role to play in the [Z-Plant] decision, but they never formally approached us – it went via government, and government said to the old Ucor, build the Z-plant, and Escom will take off the product, [whereas for the BEVA plant], there, Escom formally wrote us a letter and said build the BEVA plant, we need you, and they also helped to fund the plant; they gave us R100 million, which we repaid through product delivery" (Interview with W Stumpf).

Since Koeberg was scheduled to be commissioned before the AEC had commissioned the fuel plants (the former planned in 1983, but delayed until 1984 (unit 1) and 1985 (unit 2), the latter in 1987), Escom had to source the first few fuel loads elsewhere, as well as resolving the problem of the trapped uranium in the US. As a result, a number of high-level meetings were held between the US and South African representatives in 1981, including the heads of Escom and the AEB, and a secret agreement was reached, whereby the US would resolve the matter of Escom's uranium (by allowing it to be sold in the US), and allow Escom to source fuel from its allies in Europe, in exchange for a) the South African government entering into negotiations on the

[89] At the time, the US was virtually the only country supplying commercial enrichment services; they were joined by others from the mid to late 1970s

Namibian situation, and b) the South African government allowing a US inspection team to inspect the enrichment facilities in South Africa[90] (Eskom 1996:58-9). The agreement allowed Escom to source alternative enriched uranium from a Swiss nuclear technology corporation (The Star 10/12/1981), which was then fabricated into fuel elements in France to supply Koeberg for a few years, following which Eskom was supplied with fuel from the AEC until 1996, when the last consignment was delivered and the process was shut down (see below).

Both the motivation for the final Z-Plant decision, and the high-level diplomatic tradeoffs, indicate the broader non-energy-related strategic motivations for the government's commitment to indigenous fuel production. Koeberg and the enrichment process had a significant prestige value for the apartheid state, especially in the face of sanctions[91]. This context is brought into starker relief if one examines the nature of the programme itself. The Z-Plant was sized precisely to fuel Koeberg's two reactors only ("300tSWU only – two reactors and a spare" (Interview with A Jackson)), and eventually had a capacity of 275tSWU/a (Auf Der Heyde 1993:25), and thus to fulfil a limited strategic function only. This was clearly not a choice made by the nuclear establishment itself, which still had ambitions for a larger project, and was well aware of the economic limitations of such a small plant.

One of the many inefficiencies of the Z-Plant resulted from a decision to design the plant for later expansion, which led to a sub-optimal arrangement of the sequential enrichment stages (Interview with A Jackson). Repeated attempts were made to scale up the plant, including negotiating with the Taiwanese to supply fuel for their nuclear programme in the mid-1980s, but the economics of the plant were unfavourable: allegedly, one of the factors in favour of the plant was the extremely high SWU price in the late 1970s (at around US$250 per SWU), at which level the Z-Plant would allegedly have been profitable (Interview with W Stumpf). This declined

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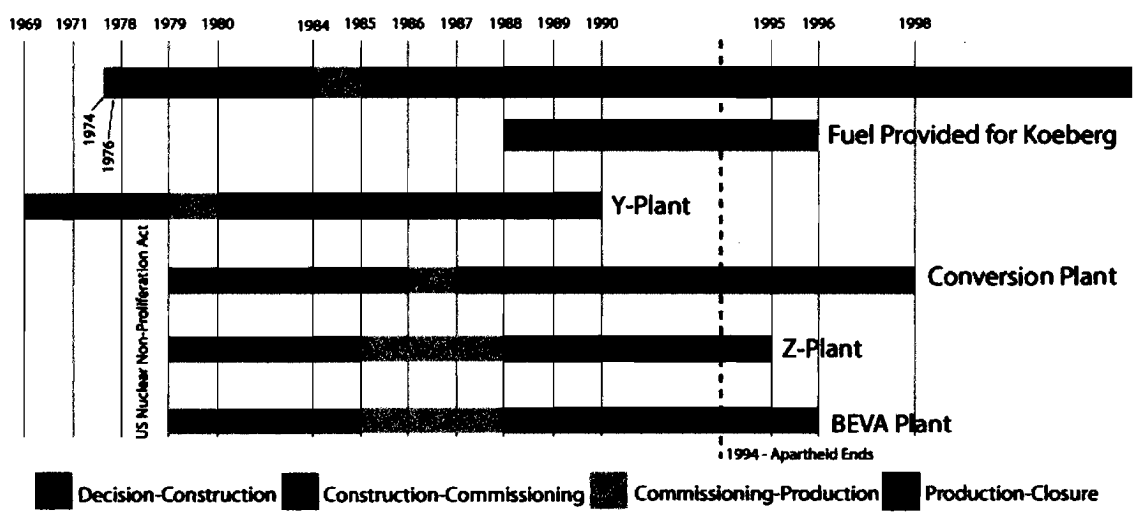
[90] This implausible-sounding narrative is from only one written source, an official Eskom account of its nuclear programme (Eskom 1996:54-59); however, the US inspection of the enrichment plant was verified by an interview with Dr Wally Grant, head of the enrichment programme during the 1970s and 1980s, as well as by interviews with several other senior AEC personnel. According to Dr Grant, at the beginning of the 1980s, a high-level meeting was held between the South African nuclear establishment and a high-ranking US delegation, including US Secretary of State General Haig; the US also sent an inspection team to examine the enrichment facilities. The South Africans apparently showed them the pilot plant and told them that they could only enrich to 40%, inadequate for a nuclear device. One of the reasons that the South Africans were willing to go this far was that Reagan had recently replaced Carter in the White House, and had a far more favourable attitude to apartheid South Africa, which included a policy of 'constructive engagement' and covert military assistance, and it was felt expedient to alleviate tensions with the US in the light of the alleged 'total onslaught' in southern Africa. The diplomatic conditions attached to the deal by the US raise more questions, and have not been verified. If the account is accurate, it suggests that the South African government attached a high value to the operation of Koeberg unrelated to any "cover story" to conceal a weapons programme. Not being able to source fuel elsewhere might have meant a delay in commissioning Koeberg of around 4 years, since in 1981 development of the fuel cycle had commenced. The technical consequences for the electricity system of Koeberg's start-up being delayed by 4 years would have probably created a short-term lack of peak power in winter, but in that year Escom's expansion programme was postponed for the first time, and the overambitious nature of Escom's expansion programme was beginning to emerge. However, other interviews highlight the immense strategic importance attached to the successful fuelling of Koeberg as a symbol that sanctions had failed by PW Botha, as well as the prestige of a functional nuclear power programme. What this incident does highlight is the non-economic value of both Koeberg and the fuel cycle to the apartheid state in the 1980s.

[91] Koeberg: "South Africa wanted to say in that regard; we have got the capability to handle something as advanced as this" (Interview with J Basson). Enrichment: "it was *the* technological project in the country" (Interview with A Jackson)

steadily during the 1980s and the 1990s, both as a result of a slow-down in reactor orders and an increase in enrichment capacity internationally, and because of the offloading of inventory at the end of the Cold War, leading to prices in 2000 of between US$80 and US$100 per SWU. However, in 1993, by which time costs/SWU had stabilised for the AEC (after being initially very high), the AEC sold enrichment services at the equivalent of US$189 per SWU, but their costs were in the order of US$440 per SWU (after Auf Der Heyde 1993:27). At the same time, the AEC was still carrying out enrichment-oriented research, primarily aimed at developing another enrichment process which would be less electricity-intensive: R400 million (nominal) was spent during the late 1980s and early 1990s on developing the Molecular Laser Isotope Separation technique[92], but lack of progress led to the termination of the programme in the 1990s.

An additional cost for the BEVA plant, and the whole indigenous fuel cycle, was the requirement that the fuel be certified by the French reactor firm Framatome, which added significantly to the cost of the indigenous process. The whole fuel cycle project lasted from the late 1970s until it was shut down in the 1990s. The timing of the key components, including the Y-Plant, is portrayed in Figure 5.3 below.

Figure 5.3: Lifespan of South African Nuclear Fuel Cycle Plants



The diagram shows key phases of the main plants, as well as the Y-plant and Koeberg power station for comparison.

[92] In the mid-1980s, the AEC made a choice between developing the MLIS technique, an unproven and technically challenging technology, or a centrifuge technology, of which there were variants already in use, and with which the AEC was familiar, as the basis for a future large-scale enrichment facility. After a heated controversy, the MLIS technique was chosen, precisely because of the scope for innovation that the technology offered; the fact that the centrifuge technique was already in use in a commercial enrichment plant was considered a disadvantage by the nuclear fundamentalists; broader techno-economic issues, including an assessment of the AEC's core competencies (which were far better suited to the centrifuge technology) were given a very low priority (Interview with A Jackson). This episode is indicative of two things: 1) the extremely narrow context of decision-making within the nuclear establishment; and 2) how this decision-making context gave free rein to the naïve technological fascination of the AEC's best engineers and awarded them large budgets (in this case R400 million).

4) 1989-2000s

The next milestone in nuclear policy was precipitated by the accession of F.W. De Klerk to the premiership, which brought about two immediate changes in nuclear policy: one of De Klerk's first acts was to order the dismantling of the weapons programme, and in order to achieve this, he imposed another change in the nuclear establishment's leadership, appointing Dr Waldo Stumpf as CEO of the AEC and Johann Maree (then Chairman of the Electricity Council) as chairman of the board. The most important outcome, however, was that the accession of the new political leadership spelt the end of the nuclear establishment's privileged relationship with the political elite: from the time when De Klerk took over, the strategic imperative (the weapons and the strategic imperative which drove investment in the fuel cycle) disappeared, nuclear power no longer had the prestige it had in the 1970s, and the nuclear establishment suffered a precipitous decline in prestige, and with it the loss of access to the political elite. Whereas the weapons programme had been a symbol of South Africa's defiance of world opinion during apartheid, in the context of De Klerk's reformist agenda (which sought to normalise relationships with the international community as soon as possible), it became a serious liability.

The new leadership oversaw a long process of scaling down and restructuring, which left the nuclear establishment a shadow of its former self by the end of the 1990s. The brief which the new leadership had was first to dismantle the weapons programme and prepare the organisation for the signing of the NPT, and second to oversee the transformation of the AEC from an organisation shrouded in secrecy with a primarily strategic *raison d'etre*, to a primarily commercial organisation. What followed was a commercialisation programme (AEC 2000 Plus), and a restructuring process which resulted in a drop in staff numbers from a peak of 8166, to 1578 in 1999 (Hofmänner 2002:147). This precipitous decline was a result of the organisation's loss of its two key strategic roles from 1991 to 1998: the weapons programme, and the fuel cycle, leaving only a handful of nuclear technology-related programmes, a few research programmes (including the SAFARI research reactor, which was partially used for the production of commercial isotopes, and also recognised as a 'national research facility' in the late 1990s), and a number of statutory obligations, including decommissioning apartheid-era nuclear facilities and overseeing the disposal of radioactive waste[93], leaving the organisation without any programmes directly related to nuclear energy. Nuclear energy-related research and development shifted instead to Eskom's PBMR programme.

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[93] For reasons of space, the development of radioactive waste policy will not be dealt with in detail here; like other nuclear states, South Africa disposes of low-level and intermediate-level waste in long-term storage, but had not adopted a solution to the long-term storage of high-level waste. Briefly, a policy framework was developed, but only after the DME had developed its own nuclear policy capacity after 2000. The two main problems were the decommissioning and decontamination of the AEC's weapons and fuel facilities, which is ongoing, and the long-term storage of the high-level waste from Koeberg. The framework has not yet resolved the latter question, in common with other countries with nuclear power facilities.

As soon as Stumpf took over, De Klerk summoned him and requested him to draw up a plan terminating the weapons programme and decommissioning the existing weapons, as a prelude to South Africa's accession to the NPT, and the ending of its nuclear isolation. By November 1989, a plan was approved, which took a year to execute: the last weapons-grade uranium was brought back to the AEC in June 1991, and South Africa signed the NPT[94] in July 1991. The decommissioning included the demolition of the Y-Plant and the destruction of all information relating to its construction (Interview with W Stumpf). De Klerk only officially announced the existence of the weapons programme to the South African (and international) public, as well as its subsequent termination and the country's accession to the NPT, in 1993.

The fuel cycle was shut down over a much longer period. The continued operation of the plants was contingent on either selling fuel to Eskom, finding an alternative market, or receiving a larger subsidy from the state. The last two options were not available: the post-apartheid state did not have a strategic commitment to indigenous fuel production, and the South African process was not internationally competitive, and could not cover its short-run marginal costs at international prices. Eskom was obliged, through a combination of political and regulatory pressure, to buy fuel from the AEC, and did so until the last consignment was delivered in 1996[95] (Department of Arts, Culture, Science and Technology 1998:49). There were direct economic benefits in Eskom purchasing fuel on the international market (see above). Although Escom renegotiated its contract with the AEC each year (Auf Der Heyde 1993:29), it required a licence to import nuclear fuel from the AEC, which was also, under the 1982 and 1993 Nuclear Energy Acts, the regulator. As the transitional process progressed in the 1990s and sanctions were progressively lifted, the collegial relationship between the AEC and Eskom "..started to sour when Eskom was becoming the main source of subsidising the AEC" through fuel purchases. The AEC was playing the role of "gamekeeper and poacher at the same time"; Morgan, CEO of Eskom during the mid-1990s, claimed that Eskom could have obtained fuel on the open market during the late 1980s (Interview with A Morgan), although this was a risk which the apartheid government was not prepared to take. Thus, in 1993, Eskom began holding discussions with the AEC and the Minister of Minerals and Energy in 1993/4 aimed at getting permission to import nuclear fuel (Auf Der Heyde 2000:19).

This process was superseded at the end of 1994 by another process – the Nuclear Fuel Cycle Initiative (NFCI), the aim of which was firstly to resolve the growing tension between Eskom

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[94] South Africa's signing of the NPT was the first (and so far, only) instance of a nuclear weapons state (a small one – South Africa only possessed a maximum of six devices) ending its weapons programme and then signing the agreement. Because this was unprecedented, the South African government was unsure of how to proceed – whether to start the inspection process immediately, or first unilaterally terminate the programme and then accede. The latter option was chosen, probably heavily influenced by strategic factors.

[95] Apparently the AEC provided roughly 1/3 of the required fuel to Koeberg in the period 1984-2000 (Interview with A Morgan)

and the AEC, and secondly to resolve pressing policy issues raised by the transition and which were not being resolved by the DMEA, which lacked any nuclear policy capacity until the late 1990s. The NFCI included the DMEA, the AEC, Eskom and also the MEPC, an ANC-aligned minerals and energy policy think-tank. The NFCI submitted a report in 1996, recommending that the conversion plant be given two years to prove itself commercially viable, and that the BEVA plant be closed (the AEC had already closed the Z-Plant themselves). They also recommended that a radioactive waste policy be developed, and that key nuclear legislation be redrafted to reflect post-apartheid realities (Auf Der Heyde 2000:20). The BEVA plant stopped operating in 1996, and the AEC took a unilateral decision to close the conversion plant themselves in 1998.

This process was accompanied in the period from 1993 to 2000 by a process of institutional reform, and the development and elaboration of a post-apartheid nuclear policy. A new actor in the transition period was the ANC, and in common with its position on most other areas of policy, it sought to delineate a policy position on the nuclear industry. ANC-aligned positions on the South African nuclear establishment in the early 1990s represented a broad coalition of three groups, which were well-represented at a 1994 conference organised jointly by the ANC Western Cape Science and Technology Group and the Environmental Monitoring Group (The Nuclear Debate 1994). This included representatives of the nuclear establishment, Eskom and others from the nuclear industry elsewhere, as well as ANC-aligned organisations, environmentalist and local and foreign academics; there were notably no representatives from government departments. The conference record (The Nuclear Debate 1994) reflects the diversity of opinions within this coalition. The ANC's traditional position on South African nuclear policy had been based on a critique of the secretive and strategic nature the South African programme; a key conference paper stated:

> "..the ANC has a long and important history of questioning and criticising apartheid's commitment to the nuclear industry. For almost three decades the ANC has alleged that the underlying motive for this industry was the manufacture and potential deployment of nuclear weapons.. " (Fig 1994:19).

The approach to nuclear policy of ANC-aligned groups at the conference can be divided into three trends. The first consisted of environmental groups, such as Koeberg Alert[96] and others, who had been active in the 1980s protesting against nuclear installations, and who were implacably opposed to nuclear power, both for its strategic associations and for its potentially severe environmental impacts.

[96] Formed in the early 1980s in the Cape to protest against the construction and operation of Koeberg; the group was treated as a security threat and subject to significant state surveillance and harassment.

The second consisted of anti-apartheid activists whose approach to the nuclear establishment was that it was primarily a strategic programme built around weapons manufacture, characterised by secrecy, and that it would probably not outlast apartheid, since it had been tarnished from its association with the strategic aims of apartheid. Both these groups had a similar set of preferences, which involved a) introducing transparency, and b) closing most or all of the nuclear industry down. For instance, Earthlife Africa asserted that:

> "..we believe that nuclear power is uneconomical, unnecessary, and irrelevant. It is characterised by danger and deceit, and is inextricably linked to militarism and unrepresentative government.." (Earthlife Africa 1994:195).

A group called Eco-Programme asserted that:

> "Apartheid had to go – Nuclear must go too. Apartheid in its statutory form is well on its way out. Like apartheid, nuclear power and its twin, nuclear weapons, are a cancer in our social body" (Eco-Programme 1994:197).

Dennis Goldberg, a senior ANC cadre, gave a paper which concluded that:

> "..our civilian policy should be: ..to close down our existing nuclear power production facilities; not to construct any further nuclear facilities" (Goldberg 1994:228).

There were two further strong underlying themes. The first was uncontested, which was that there should be strong, independent regulatory authorities, and the swift introduction of transparent decision-making. The second theme, which was not universal, was that nuclear research should be continued, with its cloak of secrecy removed. Generally speaking, ANC-affiliated critics of nuclear power supported some form of nuclear research, and the maintenance of the skills base built up in the nuclear establishment (and its possible transfer into other tasks such as renewables research), whereas environmental groups opposed its continuation:

> "..nuclear research is inappropriate in Africa, and we believe that the money allocated to this would be better spent researching sustainable energy options" (Earthlife Africa 1994:195).

The third group was a small group of energy analysts affiliated to the EDRC and the ANC Science and Technology Group, as well as the ANC's Minerals and Energy Group, which developed a more nuanced position, based on an attempt to situate nuclear policy within a comprehensive energy policy framework, and develop a framework aimed at evaluating its consistency with a newly-emerging post-apartheid energy policy paradigm. Eberhard's paper, titled 'Where does the Nuclear Industry Fit In?', attempted to place nuclear policy in this context:

> "Decisions whether to build further nuclear power stations, and/or to maintain an indigenous nuclear fuels industry, will, in the future, be based on rational analysis derived through integrated energy planning within a policy framework which seeks to advance social equity, economic competitiveness and environmental sustainability" (Eberhard 1994:49).

Work on nuclear policy by this group was built into a broader project on industrial strategy, which included an energy component, commissioned by the ANC-aligned Macro-Economic Research Group (MERG). The MERG work comprised a report by Auf Der Heyde (1993), on the fuel cycle, which ANC-aligned policy researchers had identified as a key issue, since this was the only continuing large-scale activity of the AEC. The report (Auf Der Heyde 1993) was commissioned in 1993, and published by the EDRC. It investigated the fuel cycle, and raised questions about the basic economic viability of the whole fuel programme, as well as about the viability of the AEC's MLIS[97] research programme, and most of its conclusions were fed into the ANC's 1994 Draft Minerals and Energy Policy Document (African National Congress 1994a). The report's most ground-breaking quality was that it placed in the public domain, in a form accessible to policy analysts, information unavailable until then concerning the nuclear fuels programme.

The first and second groups outlined above were swiftly marginalised, since they did not possess the resources required by the ANC for the development of a nuclear policy framework, which required the development of a policy capacity capable of making sense of the nuclear establishment; it was not clear that nuclear installations could simply be shut down, which in any case would be a complex and expensive undertaking, requiring the kind of expertise which only the nuclear establishment possessed within South Africa. There was an additional problem, which was that there was no nuclear policy capacity in government aside from the nuclear establishment itself. During apartheid, not only did the nuclear establishment make policy, but key legislation was written by it as well, in its own legal department. Not only was there a "policy vacuum" during the transition (Auf Der Heyde 2000:24), but also an institutional vacuum. Until 1998,

> "..the DME employed no experienced, dedicated official tasked with developing strategic responses and policy for the nuclear industry" (Auf Der Heyde 2000:19).

In other words, there was no government machinery which had been created to develop and analyse nuclear policy in a broader context. The process was delayed further by the appointment in 1994 of a Nationalist Minister of Minerals and Energy, who had historical ties with the nuclear establishment and was strongly pro-nuclear, and obstructed institutional reform.

The outcome was that post-apartheid nuclear policy developed in two phases. The first phase involved a process of institutional reform, which ultimately resulted in the establishment of an independent nuclear regulator at the end of the decade. The White Paper on Energy Policy in 1998 committed government to create robust nuclear institutions, including the incorporation of the nuclear sector into broader energy planning processes, the separation of "nuclear energy

[97] Molecular Laser Isotope Separation.

matters from other matters relating to the nuclear sector" (1998 Energy Policy White Paper:69), as well as ensuring that:

> "..decisions to construct new nuclear power stations are taken within the context of an integrated energy policy planning process with due consideration given to all relevant legislation, and the process subject to structured participation and consultation with all stakeholders" (1998 Energy Policy White Paper:69).

The government would also investigate Koeberg's "economic and technical performance" to determine the "optimal period for operating the plant"[98]. This signalled the end of the first phase, and as the White Paper was being published, it was being superseded by the second phase, which was inaugurated by an unexpected event, namely the decision by Eskom to develop its own nuclear reactor, the Pebble Bed Modular Reactor (PBMR).

The origins of the PBMR lie in the AEC's Erika project in the 1980s. When this project was shut down, the engineering staff were recruited by IST, one of the private sector companies peripheral to the South African arms industry in the 1980s (Hofmänner 2002:128).[99] The concept was sold to Eskom in the period from 1993 to 1995, during which period it had won converts inside Eskom's nuclear division, as well as doing well in Eskom's internal electricity scenario planning processes (Hofmänner 2002:129). The project was 'hosted' by IST until 1999 when it was transferred into a separate company (the PBMR company) housed inside Eskom Enterprises, the unregulated holding company consisting of Eskom's non-core assets. Eskom currently owns around 50% of the venture after the pull-out of the US investor Exelon; the other shares are owned by the IDC (25%), and British Nuclear Fuels (22%). The technology has been hailed by Eskom and other nuclear professionals in the country and elsewhere as the next generation of nuclear technology which resolves some of the traditional problems of nuclear reactors, and is thus being promoted as a competitive energy supply solution. However, independent analysts have been sceptical about its technological and economic merits, and Eskom has been unable to find significant international investors[100]. The aim of the project, like the 1970s large-scale

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[98] The EDRC in fact jumped the gun by commissioning their own study of the performance and viability of Koeberg in 1996 (Thomas 1996). The study was quite negative about the plant's operating record, and Eskom moved to quell any further debate on the subject, and launched a very glossy brochure titled *Koeberg: Eskom's nuclear success story* (1996), for which they commissioned one of the most prestigious South African photographers (David Goldblatt) in order to separate themselves from the apartheid-era connotations of nuclear 'white elephants', although curiously the publication also contains a defence of the nuclear weapons programme. The publication is written in a 'triumph of technology' vein, and symbolised the end of serious debate during the transition on the future of Koeberg. Initiatives such as the EDRC's were sidelined from then on, and no independent assessment of Koeberg was undertaken: for Eskom, it was vital that their existing nuclear programme be seen in a successful light in view of the proposed PBMR programme. 1996 was also the last significant attempt by the EDRC to intervene in the nuclear debate.

[99] The central concept, based on a German high-temperature gas-cooled reactor, uses fuel in the form of graphite spheres around the size of a tennis ball with embedded enriched uranium particles, can be fuelled online, and will be implemented in relatively small modules (110W each). In addition the simpler design (no secondary circuit) and its limited size mean that it is not susceptible to the same safety hazards as conventional reactors, and thus cheaper to build and operate (see www.pbmr.co.za).

[100] The best independent critique of the project is Auf Der Heyde & Thomas (2002). Thomas has recently completed another review of the technology which, based on more recent economic data, is even more sceptical about the economic merits of the project (see Cape Times 15/8/2005).

enrichment proposal, is to provide a basis for a post-coal energy system in South Africa, as well as to form the basis of a large-scale export industry.

Eskom began to seek government's support for the project in 1997; the Cabinet's response was that they would support it, conditional on public acceptance (Interview with A Morgan). Since then, the DME, in an attempt to evaluate the project from an energy policy standpoint, had overseen a number of evaluation processes, none of which have been made public. From 2000 on, the Cabinet, and the president, have been firm supporters of the project. The project has also enhanced South Africa's international standing in the nuclear community, since pebble-bed technology is seen by the industry worldwide (and particularly in the US) as a potential source of a nuclear revival. However, the PBMR is only one of three pebble-bed technologies currently being developed. Another outcome of this development is that NECSA (the successor to the AEC) is currently planning to re-enter the fuel fabrication business making fuel for the PBMR.

Thus, although the South African government has not yet committed itself to building more nuclear reactors[101], it finds itself once again actively supporting a process of nuclear power-related technology development. This support is not limited to approval, but involves a) support in developing nuclear-related skills from the Department of Science and Technology; b) financial support from the Department of Trade and Industry (a R500 million grant), c) regulatory support from the National Nuclear Regulator; and d) political and other support from the Departments of Minerals and Energy and Public Enterprises.

Government initiatives in the second phase were primarily directed at achieving a level of 'ownership' of the nuclear establishment, which was achieved through two developments: the 'rebranding' and restructuring of the AEC, and the development of nuclear policy capacity in the DME. A watershed was a review carried out in 1998 by a team of independent experts appointed by the Department of Arts, Culture, Science and Technology to review the operations of the AEC (Department of Arts, Culture, Science and Technology 1998), which was highly critical of the commercialisation process, which had made little progress. The leadership of the AEC described the review as "vicious" (Interview with W Stumpf), and managed to mitigate its effects through commissioning several further reviews which were less critical. Nevertheless, the state imposed several significant changes: statutory and research functions were strictly separated from commercial functions (mainly functions in the process of being commercialised) as a prelude to several significant institutional reforms (see below). The old leadership was replaced, and the AEC was renamed the Nuclear Energy Corporation of South Africa (NECSA) in 1999 in terms of the Nuclear Energy Act (46/1999), with the intent to remove the negative

[101] However, Eskom is currently in the last phases of seeking approval for the construction of a prototype PBMR (with an output of only one or two hundred MW, for demonstration purposes) on the Koeberg site. Government approval in principle has been granted.

apartheid-era connotations of the AEC. Nuclear safety functions were removed from the ambit of the nuclear establishment altogether, and the Committee for Nuclear Safety was replaced by the National Nuclear Regulator in term of the National Nuclear Regulator Act (47/1999).

The DME has since 2000 developed a small nuclear policy division, which has three functions: 1) assessing and promoting the PBMR; 2) developing a nuclear waste policy, and monitoring the decommissioning processes of apartheid-era plants; and 3) overseeing South Africa's involvement in international nuclear bodies and processes: South Africa now plays a key role in African nuclear affairs on behalf of the IAEA. Although there has been considerable institutional reform, South Africa is in the process of making a commitment to a new generation of nuclear power plants without a public process of consultation, and outside of the context of an integrated energy planning process: the government's 2003 Integrated Energy Plan contains no nuclear capacity in two out of the four modelled scenarios (the less expensive 'optimised' scenarios), and only the potential for nuclear power in the other two scenarios (Department of Minerals and Energy 2003:16).

Conclusion

As can be seen from the above discussion, nuclear policy-making from its inception in the 1940s until the end of apartheid in 1994 moved through several distinct phases in which it became increasingly secretive, and increasingly isolated from other parts of the state, which was one of the reasons for its spectacular failure to contribute meaningfully to the energy supply of the country. In this respect, the 1950s were a decisive turning-point which set the institutional parameters of the nuclear establishment for the next decade. In several important senses, the 1950s were a relatively open decade for debate in South Africa on nuclear policy issues. Internationally, the strategic associations which nuclear technology had developed in the wake of Hiroshima and Nagasaki dissipated as non-military applications developed, primarily involving nuclear power. In South Africa, there were several nuclear technology research initiatives in public institutions, study groups of key South African officials visited Europe to assess the potential benefits of nuclear power for South Africa, and differences in the industrial policy elite on the application of nuclear power were resolved through a public Commission of Inquiry, which openly considered the views of a wide range of stakeholders in the electricity system, including the coal industry and the railways. There was no clear 'ownership' of nuclear policy, and the future of nuclear technology and research in the country was contested by a small issue network, encompassing a relatively broad spectrum of actors in the research and electricity domains.

The key turning point, however, was Cabinet's decision to accept Roux's research proposal and institutional recommendations at the end of the 1950s, which had the effect of uniting the existing highly secretive nuclear institutions (having been designed in the strategic context of the post-war Cold War environment), with a programme of nuclear research, which was completely removed from the normal context for scientific and technical research in South Africa (the Council for Scientific Research or the universities). The AEB became the primary state nuclear institution avenues for nuclear research were closed off elsewhere, and nuclear policy decision-making devolved to a tiny policy community consisting of the leadership of the nuclear establishment, the political leadership, Escom and a few others. In terms of the criteria in Chapter 1, the resource exchange relationships were somewhat unusual, but they did exist. Although the nuclear establishment was given *carte blanche* for large parts of its history, from 1970 it required significant political support for its large projects. The nuclear establishment was very adept at building elite political networks, usually with the premier and one or two ministers (including the Minister of Mines, several of which played a vocal advocacy role for the nuclear establishment in the 1960s and 1970s), but were less adept at building broader support within the state for the nuclear agenda. Equally importantly, the nuclear establishment required the co-operation of Escom, without whose acquiescence there would be no rationale for a nuclear-industrial complex. The basis of Escom's participation, on the other had, was to defend its autonomy against potential encroachment by the AEB. For the political elite, what the nuclear establishment provided was prestige; the existence of uranium in South Africa, and the country's integration into the supply system for the US and UK nuclear weapons programmes, and later the international nuclear establishment, had provided significant prestige to a state obsessed with technocratic modernity and beginning to feel the effects of international isolation. The apartheid state was anxious to demonstrate that South Africa was not a 'third world' country, but a 'European[102]' one, which had the ability to deploy the most advanced technology successfully. Other members of the policy community, such as the coal industry, which had been involved in the 1950s and early 1960s in decision-making processes concerning the applicability of nuclear power, were progressively marginalised as the nuclear establishment developed.

The policy community consisted of a core, which comprised the nuclear establishment's leadership, the premier, and one or two cabinet ministers, and a periphery, consisting of other officials, Escom and others. From the 1958 decision, two corresponding decision streams emerge. The first was driven by a core group of what could be termed nuclear visionaries, such

[102] Meaning part of the 'international white community', since in terms of apartheid ideology, a society's level of economic and technological development was directly related to race. 'Non-white' societies were therefore expected to be technologically backward. South African trains and other public amenities were often racially classified by signs which read 'Europeans' and 'non-Europeans' (rather than white and black), which famously caused confrontations between black visitors from European countries and train conductors and other officials.

as Van Eck, Roux and Grant, whose tendency was to think in grandiose terms about the future of nuclear technology in South Africa; the central principle of this decision stream was the *ideal* of nuclear technology. Their vision placed South Africa in the forefront of nuclear technology development, and foresaw the development of a nuclear-industrial complex which would rival the coal-industrial complex which was constructed in the 1950s and 1960s. This vision was underpinned by an exaggerated form of apartheid-era modernism, which deified technological progress and had an unshakeable faith in technological rationality. Their ambition was to develop the full spectrum of nuclear technology in South Africa, including explosives, reactors and an enrichment process, which was driven both by a mid-20th century deification of technology and a real concern with future energy resources: nuclear technology, and especially seemingly promising technologies such as breeder reactors, seemed to promise limitless quantities of cheap energy, unlike fossil fuels, which were demonstrably finite[103]. The core of this nuclear vision was the process of enrichment, which was *the* nuclear technology. As one of the chief designers of the enrichment plant explained, the enrichment project was ".. *the* technological project in the country.." (Interview with A Jackson). Aside from any other factors, enrichment stood at the nexus of a number of different nuclear technologies, and was also itself probably the most challenging frontier of nuclear technology. Thus, the ambition to develop and establish an indigenous enrichment process was the key goal of this decision process, which was inherent in Roux's 1958 research programme. The programme was conducted in absolute secrecy from its inception, and Roux and Grant, the technical leader of the project, personally reported on its progress to, and applied for more funding from, both Verwoerd[104] and Vorster[105]. Their meetings were never attended by more than a handful of select Cabinet ministers. The key decision of the 1960s, whether to fund a pilot enrichment plant or not, was taken (in secret) independently of another decision-making process which would determine whether South Africa would in fact need an enrichment capability.

The second decision stream was concerned with the *application* of nuclear technology, and involved a less-defined groups of participants, including several spheres of government; the nuclear establishment's aim in engaging in this decision stream was the continual search for a *context* for nuclear technology. The key context was obviously energy, with nuclear explosives and weapons forming a lesser secondary context. In the 1950s a number of schemes were investigated including heavy water production; however the key use for nuclear technology was nuclear power. Pressure from the nuclear establishment and the government, culminating in the

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[103] Dr Wally Grant described in an interview how the realisation of the finiteness of fossil fuels gave him sleepless nights until he read about nuclear energy, after which he dedicated his life to developing nuclear technology.
[104] Prime Minister 1958 to 1966.
[105] Prime Minister from 1966 to 1978.

1965-1968 Committee, persuaded Escom by 1969 to commit to a nuclear power plant using enriched uranium, and to develop a nuclear engineering capacity of its own. This was very important, since it established the start of a credible path for nuclear technology development, which swiftly led to a third context – a large-scale enrichment plant, which would form the basis of the nuclear power programme as well as the basis for a minerals-beneficiation and export programme, utilising the South African advantage of cheap power. Even after these hopes had been dashed by the final decision on the Z-Plant, engineers in the enrichment programme sacrificed some efficiencies in the plant by designing it so that it could later be expanded into a large-scale plant. The decision-making process concerning a nuclear power programme was quite open in the 1950s, after which it was transferred to the Nuclear Power Committee, where it was more restricted (but still involved a representative from the coal industry). By the end of the 1960s, however, involvement was strictly limited to Escom, the nuclear establishment and the political elite.

Contrary to the international experience, the 1970s was not a watershed for the South African nuclear establishment, but in many ways the Waterloo of its more elaborate ambitions. Several factors combined to derail both its vision of a large enrichment plant, and an extensive nuclear power programme. The former was undermined by high electricity price increases in the mid-1970s, and the latter was finally thwarted by a fall-off in the growth rate of electricity in the 1980s, which put a halt to any further expansion to the electricity system until 2007. As a result, the late 1970s represented a turning point for the nuclear policy community. The visionaries were sidelined by the new political leadership, and the nuclear establishment was confined to a narrow set of strategic goals, which could not be sustained in an environment not driven almost solely by strategic imperatives. By the end of the 1970s it was clear that Escom was not going to order more nuclear power plants, weapons research was attenuated during the 1980s, and effort was concentrated on developing the fuel cycle on a non-economic scale.

Aside from the economic problems[106] which the nuclear establishment faced, and the Escom problem, the most striking problem was failure of the nuclear establishment to build a broad coalition within the state in favour of its nuclear-industrial complex in the 1970s, for which there were three reasons. First, the secretiveness of the nuclear establishment, which was so useful for maintaining its autonomy, also limited its interaction with other state agencies involved in economic and industrial policy; thus there appears to have been a large degree of indifference to the nuclear establishment's broader ambitions amongst the state's economic planning agencies.

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[106] The poor economic characteristics of the proposed South African nuclear complex were a deterrent, but could have been overridden if the political will had existed (probably with disastrous economic consequences), and might have been in a more extreme scenario involving a Security Council-sanctioned oil embargo, in which coal resources were conserved extremely zealously for synthetic fuels manufacture.

Second, the sheer success of the leadership of the nuclear establishment in lobbying the political elite in the 1960s and early 1970s, and the exclusiveness of nuclear policy decision-making processes did not equip the nuclear establishment (in terms of organisational capacity) for the more complicated process of policy contestation in the state at large, which was not helped by their habit of ignoring government departments; their exclusiveness meant that there was no other state agency which would be a natural ally within the broader policy system. Finally, the relative autonomy of ministries and non-civil service agencies during the Vorster era was replaced by a far greater degree of centralisation during the Botha era (see Chapter 7).

When the fuel cycle was complete, the nuclear establishment began a decline which only halted in the late 1990s, reducing a nuclear power programme to a hypothesis at best. The dream of developing an indigenous enrichment industry was kept alive with the MLIS project, but this was closed down in 1998, thus ending the AEC's key activities in nuclear technology development, leaving only subsidiary capacities not directly related to nuclear power. The long decline of the nuclear establishment was halted at around that time by Eskom's PBMR programme, which shifted the focus of nuclear technology development from the traditional nuclear establishment to Eskom, which has become its chief advocate. Again, the main characteristic of the PBMR programme is *not* a commitment by Eskom to order nuclear power plants (yet), but the development of nuclear technology. Another key fact of the programme is that it represents a direct continuation of the nuclear technology development processes in the 1980s nuclear establishment. Politically, it would not have been possible for the AEC to house the programme. Eskom, on the other hand, was able to house it with relative ease in Eskom Enterprises, and provide the necessary capital, given the political space provided by the electrification programme, the economic space provided by its lack of capital requirements, and the institutional space provided by the restructuring of Eskom in the late 1990s. The significance of this development is that the nuclear establishment is strongly dependent on its relationship with Eskom for its future prospects, and has thus largely been integrated into the electricity policy community in a subordinate role.

Despite the lack of any obvious role in the energy sector, the nuclear establishment managed to sustain high levels of state funding in the post-apartheid era, which can be explained in terms of several factors. First, and probably most importantly, the nuclear establishment was very careful to position itself as an irreplaceable asset, in the form of a technology skills base, and shift its policy context from energy to science and technology; thus, the post-apartheid Department of Arts, Culture, Science and Technology has played a major role in promoting continued support for the nuclear establishment. Second, the concept of a nuclear-industrial complex has significant resonance with the new government's industrial strategists, and third, South Africa has begun to

play a significant role in the international nuclear establishment again (including regaining its seat on the IAEA), particularly in regard to Africa, which is a source of significant international prestige. With this in mind, key decisions in the nuclear policy sphere can be contextualised in terms of the paradigms outlined in Chapter 2. The key decision moments in this regard are:

- the 1959 research programme
- the decision to build a pilot enrichment plant in the late 1960s
- the decision process relating to the large-scale enrichment plant in the mid-1970s
- the decision to develop the local fuel cycle, in the late 1970s
- the decision to begin a nuclear power programme in the late 1960s, and the subsequent decision to build Koeberg in 1974
- the closure of the fuel cycle, mid 90s
- the decision by Eskom to develop the PBMR (around 1995), and the decision to endorse this programme by the Cabinet, in the late 1990s

Given that the central relationship between nuclear technology and energy supply hinges on the existence of nuclear power plants, the relationship between these key decisions and the actual or planned erection of nuclear power plants is a key factor. This relationship exists on two levels. The first is on the simple level of nuclear plants themselves, and the associated decision-making and planning processes. The second level involves the whole nuclear energy complex, including plants and fuel cycle. This in turn is a subset of a nuclear-industrial complex, which could include a range of other subsidiary functions, such as nuclear explosives manufacture; from the 1950s to the 1970s, the promise of nuclear technology was broader than it is today.

From 1958 until 1976, the clear desire of the South African nuclear establishment was to develop a nuclear-industrial complex. The initial decision in 1958 to found a research programme focused in one institution was primarily concerned with this aim, and Roux's programme was designed with that end in mind. The model for the nuclear-industrial complex was probably the Sasol project, with which Van Eck was intimately involved: a unique combination of ground-breaking technical innovation, industrial development, indigenous resource development and strategic thinking.

Thus the decision to embark on a nuclear programme, essentially made in the late 1960s, is particularly significant. To recap: Escom's initial commitment was to a reactor in the Cape of 350MW; this was later scaled up to two reactors of 900MW each (with the completion of the grid), which turned out to be the only nuclear plant. The Government (and by proxy the nuclear establishment) had more ambitious plans: by 1970s, the Prime Minister announced a 20 000MW programme. The report on which this was based, the 1965-1968 AEB report, considered the impact of introducing nuclear power on the electricity system as a whole, and one of its

argument for nuclear power was that it would conserve coal resources for liquid fuels and chemicals plants, which was the beginning of a common theme from the 1960s onwards: that uranium would take over from coal as the chief primary energy source in South Africa, after a long period of co-existence. This view was approached with more reluctance at the time by Escom, whose planning system managed to accommodate only one nuclear power plant; the relative independence of Escom directly contributed to the frustration of a more ambitious programme in the 1970s. The aim of the Report was to undermine the credibility of Escom's resistance to nuclear power, and it succeeded in placing enough pressure on Escom to produce the required result. As a result, the process of analysis rests mainly on an assessment of orthodox criteria applied to electricity planning; however, an important plank of the analysis rested on a discussion on the impact on the country's coal resources.

Between the 1955 Commission report and the 1965 committee, there was an interesting shift. The 1955 report's main concern regarding coal was not related to its utilisation as a national resource, but the (negative) impact on the coal industry; in other words, a trade-off between separate industrial sectors. The 1965 Report on the other hand was concerned with the coal resource as a whole; thus the decision process as regards nuclear power can be considered as proto-paradigm 1 energy policy, although it was not expressed in those terms. It was also not integrated, either then or afterwards, into any kind of state energy policy institution, and did not form part of any state energy planning process. In any case, state energy planning processes and policy had 'solved' the coal problem by the late 1970s, which involved a massive *increase* in coal production. It was, however, integrated with a more exclusive decision-making process, which pertained to the development of enrichment technology.

The high point in the development of enrichment technology in South Africa was from 1969, when government approved funds for the construction of the Y-plant, to the mid-1970s, when it seemed as if the large-scale plant would go ahead[107]. The decision to build the Y-Plant was motivated by one non-energy-related concern, which was the desire to develop a capacity to develop nuclear explosives, and one energy-related concern, which was part of the project for which the construction of a large-scale plant was the ultimate aim. The key rationale for the large enrichment plant was industrial development and beneficiation; since the plant would have massively increased the load on the electricity system, it would have led to a very significant *increase* in the consumption of coal. Cheap coal-fired electricity was essential to the economics of the plant, and thus a large nuclear power programme would have rendered it uneconomical until decades later. The consideration of the plant was related to *indigenous* energy requirements

[107] Given the secretiveness of the process, and the lack of independent reviews, it is not clear how viable a large plant based on South African technology would actually have been.

only in the long term; its short-term goals were linked to the ambitions of the nuclear establishment to establish a nuclear-industrial complex, and linked into state industrialisation and beneficiation/export policies. Thus the decision not to go ahead with the plant was a result of international isolation, competition for capital (for more pressing megaprojects) and a rise in electricity prices (rendering the plant less internationally competitive) rather than a rejection of nuclear power.

The next key decision, the decision to implement a full fuel cycle, was taken for purely strategic reasons. The whole project was designed with one aim in mind, which was to provide fuel for Koeberg, which is reflected in the design of the plant. From an energy planning point of view, the impact of Koeberg not operating consistently or at all could have been alleviated by one of two options: the coal-fired plant Escom cancelled in the 1970s could have been reinstated, and would have had a shorter lead time than the fuel cycle plants, or Renamo could have been directed by the South African military[108] not to sabotage the Cahora Bassa transmission lines. Contrary to reasoning put forward by the nuclear establishment, the Z-plant could not have made a profit if the SWU price had remained high, nor could it have run at greater capacity (if Escom had built more reactors). The final decisions concerning the closing down of the fuel cycle were made by the AEC with limited consultation, mainly on account of the irrelevance of the fuel cycle to the energy system; however, it was not made within an energy policy framework.

The final significant decision-making process, surrounding the PBMR, again involved a commitment to a specific technology development programme rather than the actual acquisition of power plants. Eskom's decision-making process was based initially on the success of the PBMR in an Eskom scenario process as part of its internal electricity planning process (Hofmänner 2002:129); however, the project was sold to government primarily as an export-oriented industrial project rather than because of its future role in the energy system. The government's 2003 Integrated Energy Plan contains no nuclear capacity in two out of the four modelled scenarios (the less expensive 'optimised' scenarios), and only the potential for nuclear in the other two scenarios (Department of Minerals and Energy 2003:16).

Thus, nuclear policy has consistently developed outside of an energy policy framework, even though energy provision has served as one of the long-standing rationales of the nuclear research establishment. Institutional choices made in the 1950s, coupled with an increasingly strategic role, made it impossible to integrate nuclear policymaking into a broader energy policy framework. Despite significant institutional reform, this trend has survived the end of apartheid and the process of democratisation.

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[108] The South African military "took over" Renamo from the Rhodesian intelligence agency after Zimbabwean independence in 1980 as a means of destabilising Mozambique.

Chapter 6

The Development of South African Liquid Fuels Policy

Overview

The IEA's 1996 Review of South African energy policy notes that the liquid fuels industry,

> "..from exploration through to retailing, was enveloped in a complicated web of inter-dependent policies, informal arrangements, market sharing agreements, trade restrictions and pricing controls (only some of which were/are subject to 'regulation' in the strict sense of the term)" (IEA 1996b:171).

This accurate assessment of liquid fuels institutions reflected the reality of decades of secrecy and lack of transparency in the liquid fuels industry. A history of the liquid fuels industry in South Africa is complicated by three limitations on information. The first is the official secrecy surrounding the industry, informally from the 1960s and formally from the 1970s, until the end of apartheid. The second is the partly-related culture of secrecy of major oil companies, and the third is the lack of comprehensive records on important aspects of the industry; thus, much of the data presented here is incomplete, or extracted from possibly unreliable sources. A thorough history of the liquid fuels industry in South Africa remains to be written.

South Africa has no significant indigenous crude oil resources[1]; thus the development of the liquid fuels industry proceeded along the same path as that of other oil-importing countries from the first importation of illuminating paraffin[2] (1884) through the 1950s, when market conditions made it possible for oil companies to invest in refineries, to the 1970s, when a unique feature of the South African industry developed: a synthetic fuels industry. Up to this point, the oil industry in South Africa was dominated by four multinational oil companies, two of which operated in a partial partnership; thus three refineries were built in South Africa in the 1950s and 1960s, cutting imported liquid fuels to a minimum.

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[1] Apart from two tiny oilfields off the southern Cape coast, which only started producing crude oil in the last seven years, and will not produce more than 5-10% of South Africa's annual requirement.

[2] A note on terminology: liquid fuels products have a variety of often confusing names in different countries. Here I will use names typically used in South Africa. These relate to the IEA (IEA 2004:181,185-192) terms as follows (South African term first): LPG=LPG, avgas/aviation gasoline=aviation gasoline, petrol=motor gasoline/mogas, jet fuel=aviation turbine fuel/jet kerosene, illuminating paraffin (IP)=kerosene, diesel=gas oil/diesel oil, fuel oil/heavy fuel oil (HFO)=fuel oil/HFO.

The synthetic fuels industry began on a negligible scale with the construction by state-owned company Sasol of a synthetic fuels plant in the 1950s, manufacturing liquid fuels from coal. This technology might not have been developed further, but for the growing threat to the apartheid state of an oil embargo; the embargo was first mooted in the 1960s, and became effective only at the end of the 1970s. The reaction of the state was to launch a range of countermeasures, which involved billions of rands of capital expenditure and subsidies (mainly derived from fuel levies), and changed the structure of the industry significantly, as well as cloaking it in a veil of secrecy from which it is only now emerging.

The key state strategies consisted of a huge expansion of the state synthetic fuels industry, a programme of exploration activity aimed at finding indigenous oil resources, a large-scale strategic stocks programme, the construction of a further state-owned refinery, and the takeover by the state of a large proportion of crude oil procurement for the privately-owned refining industry. A complicated set of arrangements was concluded with the oil multinationals to accommodate the synthetic fuels industry in the liquid fuels market, as well as to induce them to continue to operate in South Africa. Most of these arrangements, and much of the regulatory system, consisted of informal agreements between government, the oil majors, and the synthetic fuels industry. These retarded the development of the regulatory system (thus protecting the oil industry), prolonged the exemption of the industry from scrutiny by the competition authorities, and prevented the development of a safe and affordable market in liquid fuels for poor households.

After the end of apartheid, most policy activity has been concentrated on formalising and overhauling the regulatory system, dismantling (and attempting to introducing transparency to) the state strategic oil infrastructure, and addressing issues of racial equity in ownership and management of the industry.

Infrastructure

1) Exploration and Resources

South Africa has only very limited oil resources, and only slightly more significant natural gas resources; natural gas fields currently exploited are concentrated off the southern Cape coast near Mossel Bay. Exploration has been extensively undertaken by both the state entity Soekor and private companies; consensus is that there are no promising terrestrial oil or gas fields, but exploration is continuing sporadically offshore, particularly off the west and southern coasts. Natural gas and condensate are pumped ashore and converted into liquid fuels in the Mossgas plant (see below).

Production from three relatively small oilfields in the same area has also recently commenced. Around 25 000 barrels/day have been produced since 1997 from the Oryx and Oribi fields, which contain around 25 million barrels of recoverable oil in total, and around 30-40 000 barrels/day have been produced from the newly-developed Sable field since 2003. 1997 crude requirements were around 444 000 barrels/day[3] (Lloyd 2001); during the period 1995-2003, South African sources have provided an average of 3.14% of total crude requirements (South Africa Petroleum Industry Association Annual Report 2004) – the rest is exported, since it is a high value light crude which commands a premium on the international market from refineries in countries which have tighter environmental regulations than South Africa.

Crude oil has been imported into the country since 1954, when the first large-scale refinery was built, and was primarily sourced in the Middle East. A state-to-state oil agreement with Iran in the late 1960s boosted the quantity sourced from that country, and after the 1973 oil crisis, Arab states imposed an oil embargo on South Africa; thus, during the 1970s, South Africa was heavily dependent on Iran (which had declined to enforce the embargo) for crude supplies (91% in 1979). After the Iranian revolution, Iranian supplies were cut off, and the procurement of crude was taken over by the state's Strategic Fuel Fund (SFF), which procured it from secret sources at a premium, and sold it at international market rates to the refining companies. With the end of the embargo, oil has been procured primarily from Iran, and more recently from Saudi Arabia, which is currently the largest supplier to South African refineries. The SFF also presided over a massive strategic oil stock, sufficient at its height to cover two years of crude supply to South African refineries; this was maintained from the 1960s to the mid-1990s, when it was drawn down to orthodox levels of around 90 days of supply. The other key primary resource is coal, which is the feedstock for the Secunda plant, owned by Sasol. Sasol produces and uses around 30% of total annual domestic coal production (Department of Mineral and Energy Affairs 1995).

2) Marketing and Refining

The central structural feature of the liquid fuels industry (with the exception of Sasol Mining) is thus the manufacturing and marketing industries, which have been conditioned by four factors. The first is the geographical distribution of economic activity, and thus demand for liquid fuels, which is concentrated on the Witwatersrand, the historical centre of mining activity, with centres of secondary importance at the coast, notably at Cape Town and Durban. The Durban-interior corridor emerged as the key focus of the industry; crude refineries were built at either ends of the corridor, connected by pipeline infrastructure.

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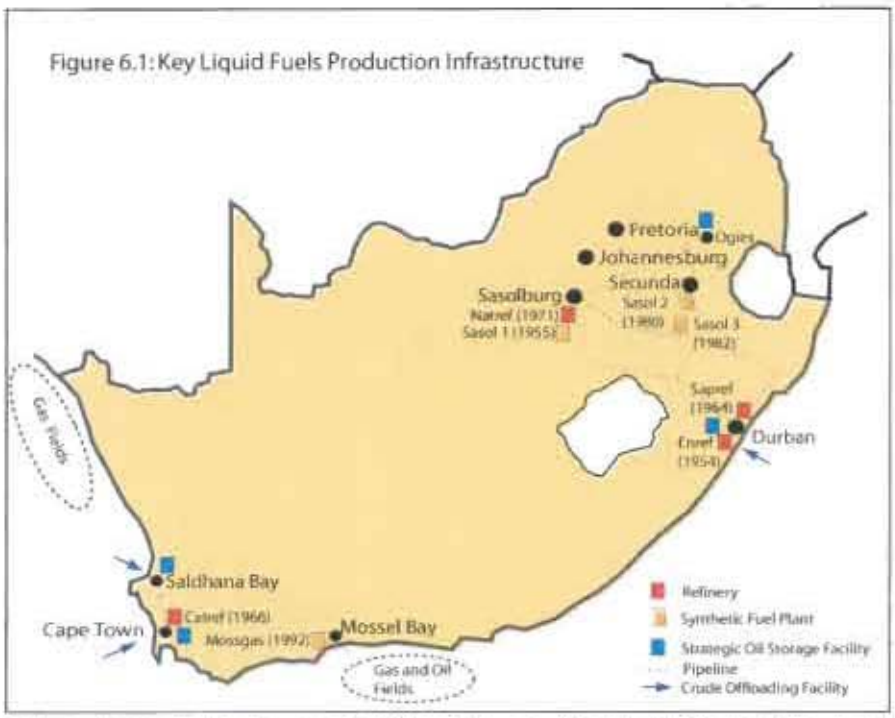
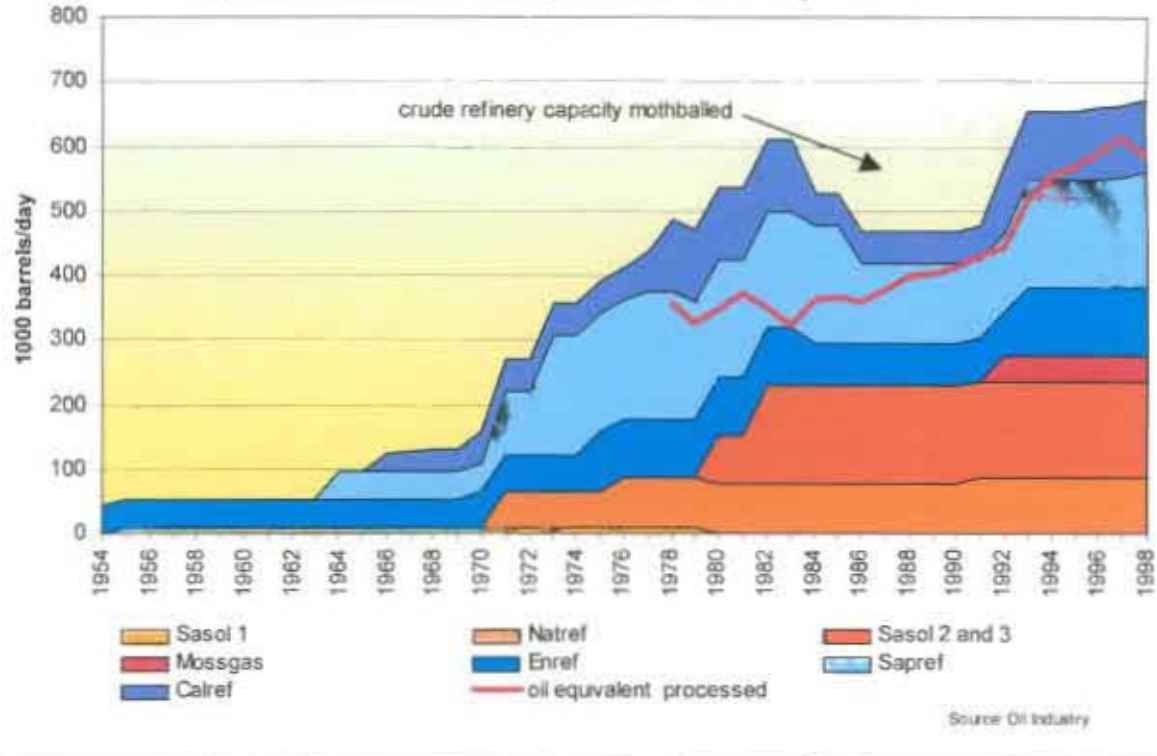
[3] Due to the significant role of the synthetic fuels industry, this is not a reflection of the liquid fuels requirements of the country, as it would be elsewhere.

The second is the constraint on competition: competition from refineries in other countries was limited by distance but largely eliminated by heavily protectionist policies, and competition between refiners was limited by regulation and the effective operation of a state-sanctioned cartel for much of the industry's history. The third, and perhaps most significant, is the history of apartheid and the oil embargo, which resulted in several key developments unique to South Africa, including a synthetic fuels industry, and a large strategic stock linked to an inland refinery. The synthetic fuel plants produce a significantly different product mix from orthodox crude refineries. The fourth is South Africa's relatively mild climate combined with the abundance of cheap coal, which in combination eliminated any significant demand for fuel oil or heating oil; thus refineries were designed to run light crudes, and to produce more high-value products. The geography of the basic infrastructure of the industry is illustrated on the map above in Figure 6.1.



Pipelines were built in the 1960s from Durban to the interior, where the key market was located, by the state railways. The 1960s also saw the beginning of international pressure to institute an oil embargo against South Africa, which led the South African government to devise a system of oil storage facilities linked to an inland refinery at Sasolburg (Natref). Natref was completed in 1971, and was owned jointly by Sasol, Total and the Iranian National Oil Company, which later sold its share to Sasol and Total. The pipeline network was extended to pump crude oil from

Figure 6.2: Nominal Capacity of SA Refineries/Synfuel Plants



Durban to Natref, and to strategic storage facilities in a disused coal mine at Ogies. The key strategic development, however, was the building of Sasol 2 (completed in 1980) in the wake of the first oil crisis in 1973, and the development of Sasol 3 (completed in 1982 – an identical plant to Sasol 2) in the wake of the second, as a means of lessening South African dependence on foreign oil. Crude oil refinery capacity, reflected in Figure 6.2 above[4], expanded significantly during the 1960s and 1970s, but was halted by the commissioning of the Sasol plants, which displaced a significant proportion of refinery production; refiners agreed to mothball some of their capacity in exchange for compensation from the state. In the early 1990s, demand increased enough for the refiners to de-mothball this capacity and to expand the capacity of their refineries. In addition, Mossgas, a further synthetic fuels project, was completed in 1992, based on the liquefaction of natural gas.

The wholesale structure of the South African liquid fuels market is dominated by the oil majors. Sasol was until 2004 excluded from the wholesale market by an agreement stipulating that the oil majors would buy all Sasol's production in exchange for Sasol not entering the wholesale market; the agreement expired in 2004. The oil majors do not have direct access to the retail

[4] The graph is a composite of data from several sources, but primarily from production records kept by the oil industry, which were kindly supplied by Dave Wallace at BP. Refinery capacity is based on the nominal capacity of the Crude Distillation Unit(s) at each refinery. The "oil equivalent processed" figures are based on actual crude quantities processed each year (including Sasol and Mossgas, where this figure is based on the quantity of synthetic crude refined), and converted into a barrels/day figure on the assumption that plants run for 300 days/year.

market; oil companies may own retail sites, but operate only a very small number themselves for training purposes.

Production and Demand

As a result of the aforementioned factors, the profile of liquid fuels produced by the South African industry is somewhat different from those elsewhere in three ways, which are illustrated by Figures 6.3 and 6.4 below. Figure 6.3 shows the product profile of individual South African refineries and synthetic fuel plants (in 1997), and Figure 6.4 demonstrates the product ratios of South African crude refineries and synthetic fuel plants (again 1997 figures), compared to aggregate production of liquid fuels in OECD and non-OECD countries (both according to mass rather than volume), arranged according to percentage of HFO produced

The first illuminating comparison is the difference between OECD, non-OECD, and South African coastal refineries: the latter are most similar to non-OECD refineries in their production profile, except that they produce less diesel and LPG, and more petrol, which is an outcome of the South African market profile as it has developed in the last three decades. Most of the HFO produced by coastal refineries is sold as ships' bunkers or used as refinery fuel. In the 1970s, South African refineries were upgraded to run lighter crude and produce less HFO (Lloyd 2001:9), but have not been significantly upgraded since in this regard, and are thus on average less complex than OECD refineries. The second significant difference is in the cost structure and product profile of Natref, the inland refinery, which on account of its location (in the coalfields) has no natural market for fuel oil; thus it is a considerably more complex refinery than the coastal refineries, and produces very little HFO. It also produces higher quantities of jet fuel to supply South Africa's main international airport near Johannesburg (Lloyd 2001:9).

The third, and most significant difference, is between the product profiles of the crude refineries and the synthetic fuels plants[5], which produce only negligible quantities of heavy oils by comparison to crude refineries, and produce a significantly larger proportion of petrol than conventional refineries. Whereas crude refineries are constrained by the composition of crude oil, and can only produce 7% more petrol than diesel, the synfuels plants, because of the synfuels process, produce 150% more petrol than diesel (Lloyd 2001:9), which is significant in the context of the demand profile of the South African market. On the other hand, the nature of the synfuels process is inflexible in terms of product ratios; unlike crude refineries, the product ratios

[5] The synfuels plants are based on the Fischer-Tropsch process, which synthesises hydrocarbons from a coal- or natural-gas derived gas mixture of hydrogen and carbon monoxide, which are then fed through a refinery. The process produces higher yields of high-value products. Because of the nature of the process, petrochemicals can be produced which cannot be produced in an orthodox refinery, which adds significant value to the output of the plants. For a more precise technical account, see Lloyd (2001) or Collings (2002).

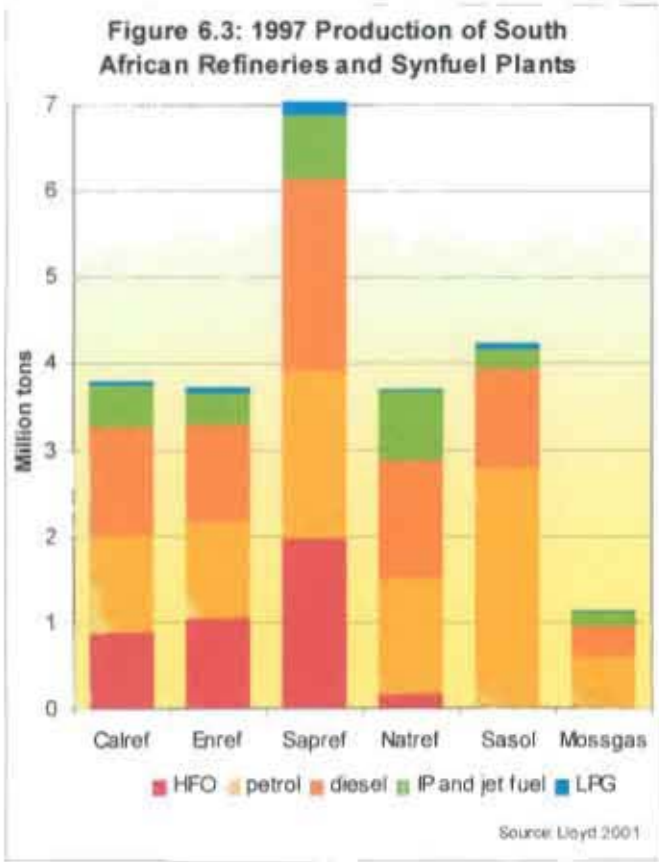


Figure 6.3: 1997 Production of South African Refineries and Synfuel Plants
Million tons
0
1
2
3
4
5
6
7
Calref
Enref
Sapref
Natref
Sasol
Mossgas
HFO
petrol
diesel
IP and jet fuel
LPG
Source: Lloyd 2001

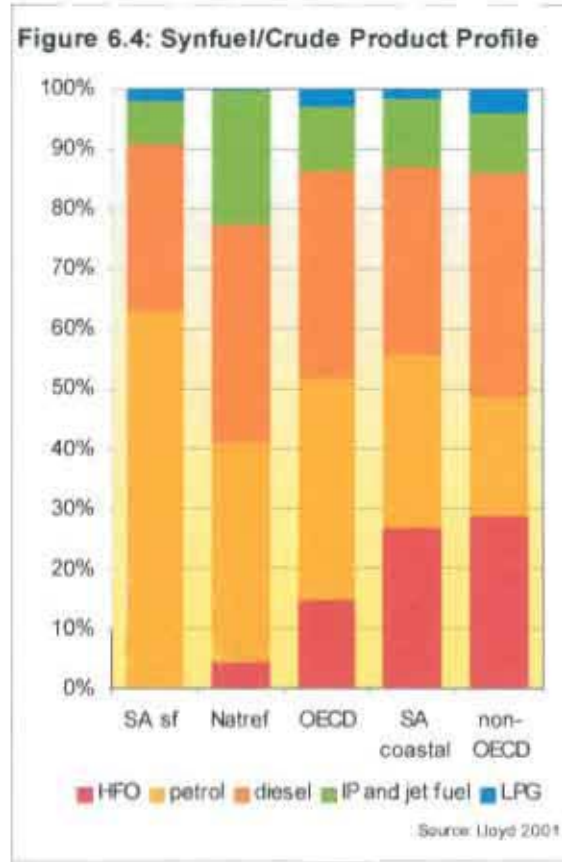


Figure 6.4: Synfuel/Crude Product Profile
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
SA sf
Natref
OECD
SA coastal
non-OECD
HFO
petrol
diesel
IP and jet fuel
LPG
Source: Lloyd 2001

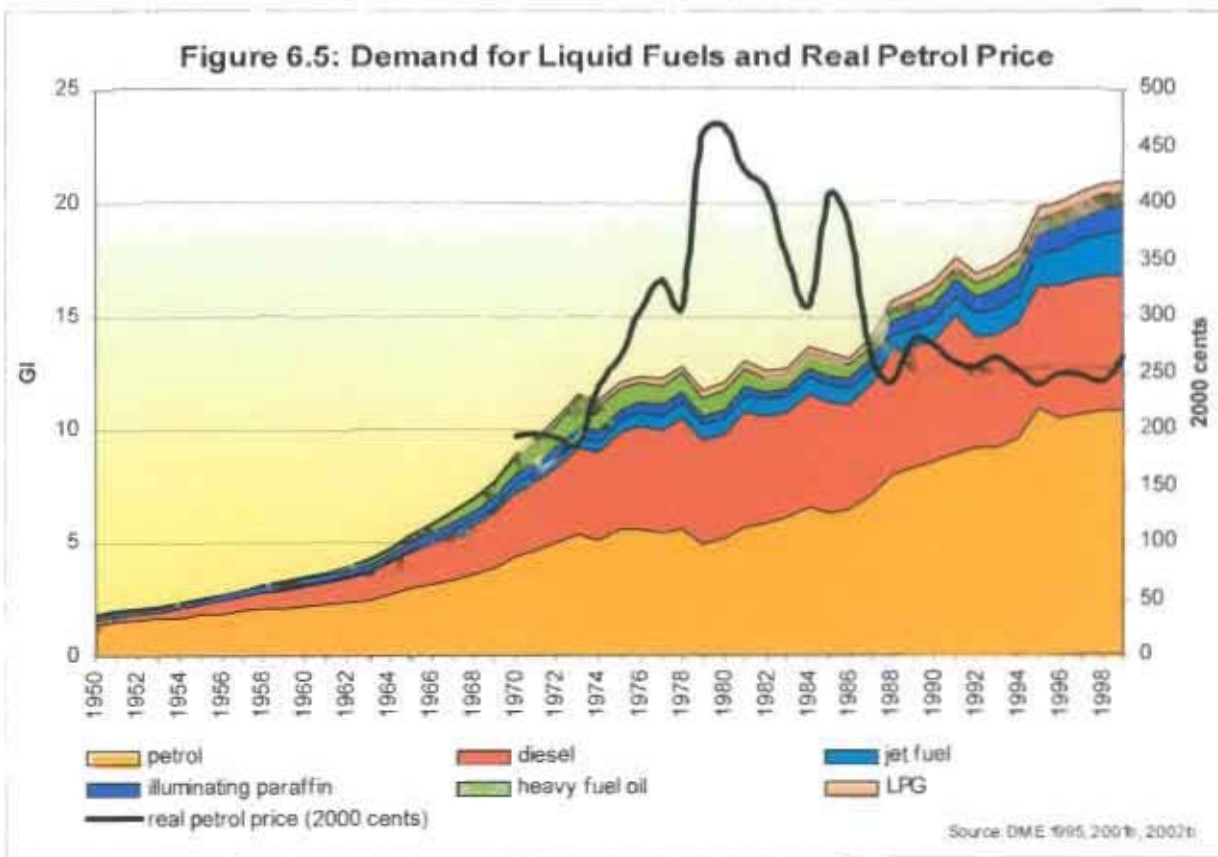
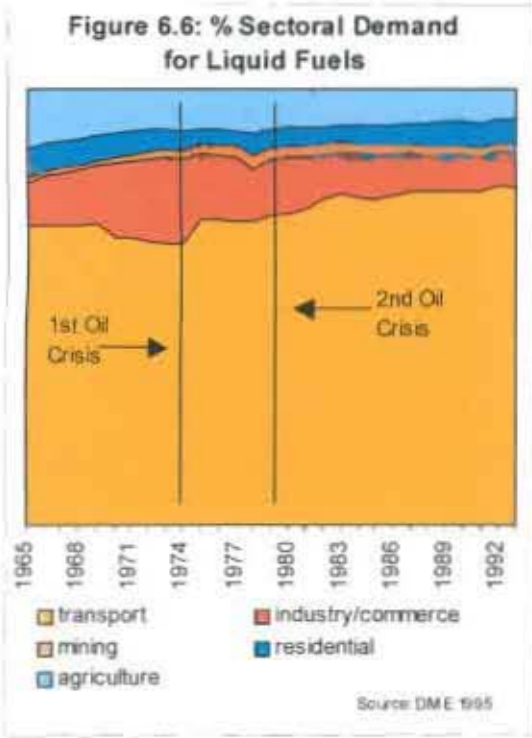


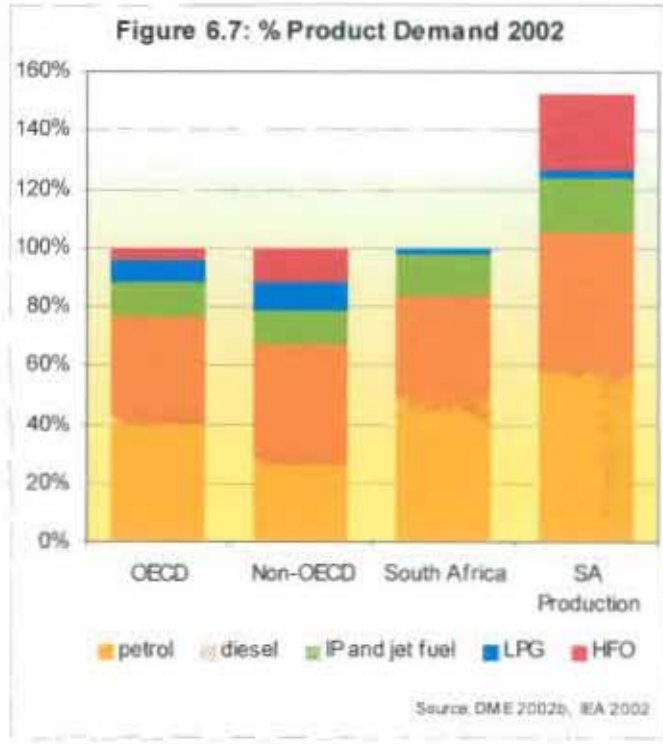
Figure 6.5: Demand for Liquid Fuels and Real Petrol Price
GI
2000 cents
0
5
10
15
20
25
0
50
100
150
200
250
300
350
400
450
500
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
petrol
diesel
jet fuel
illuminating paraffin
heavy fuel oil
LPG
real petrol price (2000 cents)
Source: DME 1995, 2001b, 2002b

of the synfuels plants cannot easily be adjusted. The other key difference is in primary energy consumption; due to the energy intensity of the synfuels process, significantly more energy per unit of liquid fuels output is required than for a crude refinery, which has significantly increased the energy intensity of the South African economy. The synfuels process also produces a number of unusual petrochemicals not produced by orthodox refineries, which adds significantly to the value of the process, and makes it more difficult to compare the economics of synfuel production to orthodox refining. The Sasol process also involves a very large-scale coal mining process.

Aggregate demand for liquid fuels in South Africa has grown consistently over the last 50 years as illustrated in Figure 6.5 above, with the exception of a period of disruption from the first oil crisis to the mid-1980s, when the price of liquid fuels underwent steep real increases, not only because of the oil crises of the 1970s and the concomitant increased in the crude price, but also because of premiums included in the petrol price during this period, both to fund the Sasol projects as well as to cover premiums on crude sourced secretly on the international market.

The structure of demand in South Africa is unusual in several respects. The first is the significant decline, in both real terms and relative to total liquid fuel use, of liquid fuel use in industry as a result of the two oil shocks, as demonstrated by Figure 6.6 below. Partly for economic reasons, and partly as an outcome of government policy, HFO use was significantly attenuated in South Africa in the wake of the oil crisis, which led crude refineries to invest significantly in additional plant to increase their yields of 'white product' (Financial Mail 16/12/1977). In addition, as mentioned above, there is no significant use of liquid fuels for electricity generation: the percentage of sent-out electricity generated from liquid fuels reached a peak of 0.08% on Escom's system in 1978, before declining to 0.002% in 1992 (Department of Mineral and Energy Affairs 1995:31). The second is the relatively high use of illuminating paraffin by households; in most middle-income countries, IP (which is unsafe and unhealthy) has been replaced by LPG. The third is the high usage of petrol in transport instead of diesel, for which there are two important historical reasons: government discouraged the use of diesel in various ways for strategic reasons (to free up supplies for the military) and from the 1980s onwards, a public transport industry arose based on minibuses, which are petrol-driven vehicles. This trend was exacerbated by a fall in military demand, as the war in Namibia ended in the mid-1980s (Lloyd 2001:11, Interview with senior DME official). The way in which the limitation on diesel consumption was achieved was through taxation of diesel vehicles, as well as a pricing strategy which did not differentiate between petrol and diesel, as most countries do. The basis for price regulation did not permit producers to discount diesel to encourage its consumption. The key factor for the apartheid government however was that the synfuels process produces relatively small quantities of diesel; in the 1980s, when Sasol's share of total liquid fuels production for the





domestic market was at its peak, Sasol had the capacity to supply over 50% of the country's petrol requirements, but only a maximum of 30% of its diesel requirements, which would possibly have led to a supply crisis if the oil embargo had succeeded and the war in southern Africa had escalated. Another factor driving petrol demand in South Africa is the social and spatial structure of South African cities, which have relatively dispersed settlement patterns on account of apartheid spatial planning; thus poor commuters travel large distances to work in petrol-driven vehicles. Wealthier commuters almost exclusively travel by private car; public transport, which is inadequate and unsafe, is generally avoided by wealthier commuters.

The relationship between production and demand in South Africa is not straightforward, since the indigenous industry supplies the whole southern African region, and refinery capacity is planned accordingly. The heavy petrol bias of the economy is partly catered for by the synfuels industry (which produces a far higher ratio of petrol), which obviates the need to import either petrol or significantly larger quantities of crude oil, and thus having to export the resultant non-petrol products (Lloyd 2001:11), although if the industry had not fulfilled that role, it is arguable that policies restricting the use of diesel might not have been pursued. The product demand profiles of OECD countries, non-OECD countries, and South Africa are portrayed in Figure 6.7 above, as well as the actual production profile of South African refineries: columns 3 and 4 are in the same scale, and the comparison thus indicates the proportion of surplus fuels exported. Particularly notable is HFO production, some of which is used as refinery fuel, and almost all of the rest exported. The

demand for petrol and kerosene, and the lack of demand for LPG and fuel oil, set the South African profile apart.

Actors and Institutions

1) Key Industry Actors

The key industry actors in the liquid fuels industry are the five oil majors and Sasol, who between them dominated almost the entire refining and marketing industries, with Mossgas playing a lesser and more recent role. Four of these five key oil multinationals, BP, Shell, Caltex and Mobil (called the Standard Vacuum Oil Company before the 1950s), had an early presence in South Africa as importers and marketers of liquid fuels before 1950. Total entered the market in the 1950s, and other smaller companies, including an 'Afrikaner empowerment' company Trek (owned by Genmin and a consortium of oil majors, including the IDC), and Sonarep, a Portuguese marketing company, entered the market in the 1960s. BP and Shell, as part of an agreement which divided Africa into 'spheres of influence', operated in South Africa in a joint holding company, the Consolidated Petroleum Company, which developed the Sapref refinery, although they marketed product as separate brands. This arrangement was terminated in 1975, although the refinery is still jointly owned and operated (Financial Mail 27/6/1975). Total gained a share in the refining industry in the late 1960s via participation in Natref, which was owned jointly by Sasol (52.5%), the National Iranian Oil Company (17.5%) and Total (30%) (Financial Mail 7/6/1968); the Iranian stake was sold in the 1980s, and Total's stake increased to 33.3%, Sasol holding the remainder. Trek held the licence to build the next refinery in the 1970s, which was planned for Richards' Bay, a developing industrial hub, which also had a deep-water port which could potentially offload large crude carriers (Financial Mail 5/3/1971); however the oil crisis and the Sasol project scuppered the plan, and no new crude refineries have since been built. In the late 1980s, Mobil disinvested under pressure from the US, and sold its South African interests to Gencor (successor to Genmin), which consolidated Mobil's, Trek's and Sonarep's assets into a new oil company called Engen, a majority stake in which was sold to the Malaysian state oil company Petronas in the mid-1990s. Talks are currently underway to merge Engen and Sasol, a merger which is opposed by the other oil companies on competition grounds.

Sasol was founded in the early 1950s as a wholly state-owned company (owned by the IDC), after a private partnership failed to devise a viable coal-to-oil project, and constructed Sasol 1, a relatively small synthetic fuels plant, in 1955. Sasol subsequently took a dominant stake in Natref, built adjacent to Sasol 1 as part of a strategic oil supply strategy. The company achieved a dominant position in production, however, with the construction of Sasol 2 and 3, producing a significant proportion of the country's liquid fuels requirements. This stake declined as the other crude

refineries expanded in the early 1990s. Sasol was privatised from 1979 in a gradual process lasting around a decade, primarily in order to fund Sasol 3. Sasol has significant interests not only in refining and synthetic fuels, but also in coal mining and petrochemicals, which contribute significantly to the group's profitability. Mossgas, still state-owned, was built in the late 1980s in order to maintain a threshold of synfuels production as a strategic measure, and is now integrated into the newly-formed state oil company PetroSA, together with the assets of Soekor, the state-owned exploration company.

Marketing of liquid fuels has been dominated by the majors, with a few minor players entering and exiting in the last half-century. Sasol and Mossgas had no marketing bodies of their own, and the overwhelming majority of their product was marketed through the oil majors via an 'uplift' agreement (The Crude Refiners' Agreement), whereby the oil companies would buy all of Sasol's output at a regulated price and market it. The agreement was initially drawn up between Sasol and the oil industry (with government backing) to accommodate production from Natref in the 1960s, and later extended to cover Sasol 2 and 3. The agreement expired in 2003, and Sasol entered the retail market in 2004. Product from the Mossgas plant is still marketed through the oil majors.

Because of the structure of the industry, the regulatory system and the immunity accorded to the industry from competition legislation on account of its strategic status, there has always been a high degree of co-operation amongst oil majors. Gathering of data, determination of market share, and conducting relationships with the state were undertaken collectively; this was enhanced by the high degree of co-operation with the state which became necessary during the oil embargo (Interview with senior oil industry executive). The oil majors had excellent access to government during the apartheid era, and subsequently. Sasol was even much more closely integrated with government agencies, through shareholding and governance relationships, its role in the strategic stocks programme, and through elite networks, since its leadership was strongly aligned with the Nationalist leadership of the apartheid government and were in most cases members of the Broederbond (Wilkins & Strydom 1979: 428, Appendix 1).

The oil majors and the synfuels companies comprised two distinct centres of influence in the industry until the late 1990s, when Sasol joined the industry body, the South African Petroleum Industry Association (SAPIA). SAPIA was formed in 1994, and plays a significant role in policy processes and regulation on behalf of industry. A third centre of influence arose in the 1990s, comprising a new generation of black-owned marketing companies, which were in almost all cases integrated into the majors or Sasol as part of a Liquid Fuels Charter agreed between the companies and government by 2002; a key role was played by the African Minerals and Energy Forum, formed to promote black interests in the industry in the mid-1990s. The Charter process has entrenched the

structure of the industry by encouraging the transfer of equity to black participants rather than conceding market share to new entrants.

A key state entity involved in the liquid fuels industry is the state transport parastatal Transnet (previously South African Railways and Harbours), which played two key roles. The first was the transport of liquid fuels by train from importers, or later the coastal refineries, to inland depots and other points of consumption. From the 1960s, pipelines were constructed for the same purpose, also owned and operated by SAR and H/Transnet, through a subsidiary Petronet, which from the late 1960s also transported crude oil to inland strategic storage points as well as to Natref. The second was the setting of railway and pipeline tariffs, which were unregulated and had a significant impact on the price of liquid fuels, since the regulated price contained a transport element which reflected this administered price. Since the pipeline network and the rail network were monopolies, rail and pipeline prices were and are an unavoidable element in liquid fuels price structures. The post-apartheid government has recently established an independent Pipelines Regulator to approve pipelines prices.

Two other key industry groups which have played a significant role in policy processes are the industry organisations of the retail trade, representing service station owners, and trade unions. The Motor Traders Association (MTA) was replaced by the Motor Industries Federation (MIF) in the latter part of the century. These associations played a key role in regulating the retail trade through their involvement in the Joint Petrol Advisory Committees (JPACs) and later the Rationalisation Plans, both of which regulated service station numbers, locations, service levels and business affiliations, as well as representing the retail trade in negotiating retail margin increases.

The role of trade unions, particularly the COSATU-affiliated unions involved in the oil industry, the Chemical Workers' Industrial Union and the National Union of Metalworkers of South Africa, was particularly significant during the transitional policy-making process in the Liquid Fuels Industry Task Force, as well as contributing significantly to the ANC's energy policy. Groups external to the industry, such as the Automobile Association, chambers of commerce and industry, minibus taxi associations, and agricultural unions, provided significant short-term political pressure on the government to address concerns relating to the petrol price, but were relatively ineffectual in lobbying for significant policy change.

2) Government Departments and other State Agencies

The role of government departments in the liquid fuels policy process has been threefold. The first role was regulation of liquid fuels prices and other aspects of the industry such as service levels and importing; these were based in the Department of Commerce and Industry from the 1930s, and then in the Department of Commerce when the departments split in the 1960s, before being placed in the

Department of Mineral and Energy Affairs when it was formed in 1980, with one exception; the regulation of upstream exploration and production licensing, which was delegated to Soekor in the 1960s, but in the 1990s was removed and placed in a separate agency, the Petroleum Agency. Stakeholders, including the oil industry and the MIF were directly involved in the regulatory process through a web of informal agreements and processes overseen by the departments, related to the regulation of prices, service station location, refining and importing and exporting crude oil and liquid fuels.

The second role was policymaking, which was based in the same departments mentioned above; however, policy concerning indigenous development of refining and the synthetic fuels industry was based in the industry section of the Department of Commerce and Industry. Significant roles in the policymaking process were also played by other non-departmental state agencies, notably the Industrial Development Corporation, which played a lead role in the development of the state's crude refining assets (Natref), strategic stocks, and synthetic fuels industry, as well as in the policymaking process. Another key entity was the Energy Policy Committee, which took key decisions concerning the state's oil security strategy in the 1970s and early 1980s; unlike in other major parts of the energy sector, the EPC was centrally involved in decision-making processes in this case.

The third key role comprised direct involvement in the industry itself, which was focused on the state's oil security strategy. Given the secrecy of the decision-making process, it is difficult to separate direct state activity in this regard from policymaking, since most key decisions were taken or fully formed inside what might be termed the state's 'oil security elite', which comprised a set of state and private organisations articulated by the oil security strategy. The main actors were a small elite of politicians, bureaucrats from the Departments of Commerce and Industry and the DMEA, the IDC, Sasol (until its privatisation, when its involvement was curtailed), and the oil majors, whose co-operation was a vital element of the strategy, but who were not involved in major decision-making processes.

The security strategy originated in the 1960s, and initially involved the stockpiling of oil, for which purpose the Strategic Fuel Fund was established in 1964 by the IDC. This was linked to the development of an inland refinery adjacent to Sasol 1, Natref, as well as a network of crude oil pipelines which could pump oil to Natref as well as to or from the strategic stockpile, or from the strategic stockpile to the coastal refineries if necessary. In the 1970s, Sasol 2 and 3 were constructed through the IDC. To fund the capital cost, as well as establish a financial instrument to deal with various other aspects of the synthetic fuels programme, a State Oil Fund was established in 1977, which in 1985 was converted into the Central Energy Fund and placed with other funds in a holding

company, the Central Energy Fund Pty (Ltd), which housed the state's remaining oil assets, including Soekor and the SFF, and later Mossgas; CEF played a central role in the Mossgas project. Another crucial development in the early 1980s was the centralisation of oil trading on behalf of the oil majors in the SFF, which assumed the role of procuring oil for most of the refining industry to circumvent the oil embargo. This required the collaboration of the oil majors, both in co-ordinating the acquisition of crude oil and in strategic planning for the future of the industry, which could not be done through the normal policy channels because of the extreme levels of secrecy; even relatively senior energy bureaucrats did not have access to key information concerning crude importation or liquid fuels demand (Interview with J Basson). The other purpose of CEF was to act as a funding conduit for energy policy activities generally, and the National Energy Council specifically; however, this ceased with the demise of the NEC.

Price and the Regulatory System

Since key aspects of the industry (including price) have been regulated by a host of formal and informal arrangements since the 1930s, an understanding of the dynamics of liquid fuels prices primarily involves an understanding of the development of the regulatory system, which in turn was significantly influenced by the state's oil security programme. A central feature of the system was that the price of synthetic fuels was, and is, linked directly to the price of crude-derived fuels, even though the cost structures of the two industries are different. The regulatory system consists of what the Department of Minerals and Energy's chief liquid fuels bureaucrat referred to in 2002 as a 'spider's web'[6] consisting of import control, regulation of service station numbers and location, and price regulation.

One of the reasons for the complexity and non-transparency of the system was its informal nature, which from the development of the service station industry in the 1930s was comprised of a series of 'agreements' between different industry actors, and between industry and government. Price-setting and other co-operative arrangements between industry players were endorsed by government, and enforced by control of the supply chain by the oil industry, and only formalised over a long period beginning with the second world war and ending with the post-apartheid government. This informal characteristic makes it hard to identify concrete regulatory processes, which in the case of price regulation, were only placed on a solid statutory footing in 1977 via the Petroleum Products Act. Before that, price regulation was carried out by a series of measures including 'gentlemen's agreements', various War Measures (renewed until the 1960s), and the Price Control Act (from the 1960s), in terms of which liquid fuels fell into a category in which government did not prescribe prices, but an 'agreement' with the industry concerned stipulated that

[6] In a presentation to the Parliamentary Portfolio Committee on Minerals and Energy.

prices would not be raised without government consent. After 1977 other regulatory aspects of the system were still conducted informally until after the end of apartheid. However, regardless of the mechanism which was used by the state, price setting was undertaken by industry from the 1930s, and prices were effectively set by government from the 1940s.

The development of the regulatory system occurred in several phases. The historical foundation of the system was the regulation of the retail industry, which before the development of an indigenous refining industry, was based entirely on imported fuel; during this phase, regulation was carried out by the industry itself, which controlled the retail price and entry to the market by denying supply to offenders. In phase 2, the state took control of the price-setting process for retail petrol sales, and wholesale margins were regulated from 1946, but the watershed was phase 3, which began with the development of an indigenous refining industry. Refinery gate prices were regulated, and imports restricted. Wholesale, retail and refinery gate prices were regulated through the Price Control Act from the 1960s. Phase 4 began in the 1970s with the development of the synthetic fuels industry and the oil embargo, which required various modifications to the system to accommodate requirements of the state's oil security strategy, and phase 5 consisted of the 're-regulation' of the system following the demise of apartheid, which finally formalised the whole regulatory system, although its essential elements still remain in place.

Evolution of the regulation of the supply chain

All liquid fuels except HFO were and are regulated at the refinery gate, petrol, diesel and illuminating paraffin are regulated at wholesale level, and petrol is regulated at the retail level. The structure of the petrol price has remained essentially the same since the 1950s, and consists of the following components: a basic fuel cost, which is based on a theoretical price of importing fuel, a transport component, reflecting the cost of transporting fuel to a specific location within the country; a tax component, comprising various government levies; a wholesale margin, and a retail margin. Other insignificant elements have been added and removed from time to time. The liquid fuels market (and the price in the long run) is also influenced by other forms of regulation, including import and export control and regulation of non-price aspects of the retail trade, which will also be reviewed below.

Regulation of the Retail Trade: the origins of regulation

The objectives of retail price regulation have been traditionally integrated with two other objectives: the maintenance of standards of service at retail outlets (service stations) in related services such as car sales and maintenance, and the maintenance of levels of profitability of retail outlets; thus retail price regulation processes have in South Africa involved close co-operation between service station owners, product wholesalers (oil majors) and the state. The retail sector was the original context for

the development of the pricing regime, which was initially based on petrol, which was largely distributed through retail channels. Diesel, on the other hand was largely distributed through wholesalers to large-scale buyers, with only a small fraction being distributed through service stations.

Liquid fuels were first imported into South Africa in 1884, mainly in the form of IP (Lloyd, Rukato & Swanepoel 1999:2). From then until 1954, all[7] liquid fuels were imported into South Africa by four companies – BP, Shell, Mobil[8] and Caltex – who marketed products locally. Initially, liquid fuels were distributed by general dealers; however as volumes increased, and the primary products sold shifted from IP to petrol and diesel (for transport rather than illumination), the liquid fuels trade became increasingly dominated by 'service stations' dedicated to supplying motor vehicles; service stations installed pumping equipment and could thus deliver high quantities of petrol and diesel. Prices were fixed in agreement between the companies and the service station owners' interest group, initially the Motor Traders Association (MTA) and later the Motor Industries Federation (MIF), with the aim of limiting competition between service station sites and brands. After initial opposition, the state endorsed the system in 1937, and a system was set up for the control of the service station industry, at the centre of which were Joint Petrol Advisory Committees (JPACs), with representatives from companies and the MTA (Van den Berg 1993:6); petrol sale by general dealers was also discontinued (companies ceased supplying them) except where there was no service station in the area. The aim of these committees was to rationalise the geographic distribution of service stations and set prices, and thus improve profitability of individual service stations, thus establishing three traditions in the industry: 'resale price maintenance', a high degree of collaboration amongst key actors (resulting in limited competition), and the circumscribed role of the market. During the second world war, the state took over the role of price-setting, which continued afterwards in terms of a series of 'gentlemen's agreements' with industry.

Aside from a freeze during the second world war (when the committees came under the control of the National Supplies Control Board), these arrangements led to significant barriers to market entry, since entrance to the market was effectively controlled by the JPACS, and via these, the MTA (Trollip 1996:4-30) and the oil companies. After several abortive attempts by the state (and in particular by the BTI) to challenge the control of the industry by the JPACs, the system was semi-formalised by the establishment of the Rationalisation Plan (referred to as the 'Ratplan') in 1960, which was a "..gentleman's agreement between Government, the oil companies and the [MTA/MIF]" (Van den Berg 1993:18), and was not formalised in either legislation or regulation. The formal purpose of the Ratplan was to ensure service standards and 'rational use of resources' to

[7] Except for a tiny quantity produced from oil shale by the SATMAR plant from the 1930s.
[8] Mobil was named the Standard Vacuum Oil Company until the 1950s.

guarantee profitability of service stations (by concentrating throughput), and "..to provide fuel nationally at a reasonable price by maintaining a countrywide network of viable petrol outlets" (Van den Berg 1993:17). Informally, a central function it performed was to divide the retail market amongst oil companies, which was thus effectively done by companies themselves. Because the Ratplan had no official status, it was enforced by the oil companies through the threat of withholding supply. A series of Ratplans performed this function until 2002, when the Petroleum Products Amendment Act imposed a licensing process on the retail industry, and vested this process in the Department of Minerals and Energy.

The Basic Fuel Cost

The regulatory innovation of the 1950s was the regulation of refinery gate prices, which was introduced with the construction of the first crude refinery in South Africa, and Sasol 1, which came on-stream in 1954 and 1955 respectively. Government aims in this regard were to encourage import substitution and industrialisation, and oil companies wanted a guaranteed return on investment, given the small size of the market and the distance to other markets. The agreed basis for regulation was an import-parity pricing system referred to as the Steyn formula (Interview with T Burger), named after its originator, J.G.G.F. Steyn, later Secretary of Trade and Industry and also Price Controller in terms of the Price Control Act (1964). The formula calculated an In-Bond Landed Cost (IBLC), which consisted of a number of elements.

The key element was an international product price (for example 93-octane leaded petrol), calculated as an average of a basket of FOB[9] posted prices from four international refineries. To this was added hypothetical freight, insurance, leakage, and landing charges for a South African port, to derive the IBLC. If the refinery was at the coast, then the IBLC was the refinery gate price. If the refinery was inland (Sasol 1, 2, 3; Natref), then a premium was added in the form of a hypothetical transport cost (as if the product had been shipped inland to the refinery gate).

The IBLC was initially based on the posted prices of four refineries selling products on the international market, which were owned by multinational oil companies[10]. The reference refineries were nationalised in 1973 with other oil company assets in the Middle East, at which time Arab governments began to set product prices at their refineries. Because prices from these refineries were thus no longer 'market prices', the South African government changed the basis for the IBLC to the posted prices of three refineries in Singapore and one in Bahrain (Van Den Berg 1993:27), which were owned and operated by the 'big four' oil majors operating in South Africa[11]. These

[9] Free On Board

[10] There is no indication as to which oil companies these were, although it is probable, given later developments, that these were the four majors operating in South Africa at the time.

[11] The refineries were BP Singapore, Shell Singapore, Mobil Singapore and Caltex Bahrain [CS – see footnote 15].

were maintained until the transition, when the Liquid Fuels Industry Task Force recommended changing the reference refineries, and adding a fifth element, a Platt's spot assessment. In addition, while previously the IBLC had been calculated infrequently to avoid small changes in the petrol price (a 'slate' mechanism was devised to compensate for 'over-recovery' or 'under-recovery' by the refining companies), the LFITF recommended that the petrol price change once a month: these changes were adopted in 1994[12]. The IBLC was finally replaced by the new government in 2002 by a Basic Fuel Price, also calculated on an import parity basis[13], using an average of daily spot prices from three destinations (Singapore, Mediterranean (Italy) and the Arab Gulf) to calculate a monthly product price for each product class. Freight, insurance and wharfage are calculated in the same way, but another element has been added at the request of the oil industry to simulate the true cost of importing product, consisting of two components, a 'coastal storage cost', to reflect the hypothetical cost of using coastal storage facilities if large amounts of product were imported, and a 'stock finance cost', to cover finance charges related to stock acquisition. The government's stated aim in determining this formula was to "represent the realistic, market-related costs of importing a substantial portion of South Africa's liquid fuels requirements"; thus

> "..it is therefore deemed that such supplies are sourced from overseas refining centres capable of meeting South Africa's requirements in terms of both product quality and sustained supply considerations" (www.dme.gov.za 11/10/2004).

The freight component of the IBLC was also subject to scrutiny by the LFITF, since when the formula was devised, average tanker size was small. The tanker size used in the calculation remained constant until the 1990s, even though the average tanker size used for transporting liquid fuels had grown considerably larger, which had considerably lowered the cost per unit. Thus the LFITF recommended that the basis for calculating transport costs be altered as well, using realistic contemporary vessel sizes, which was also accepted by government in 1994. The remaining element, the inland transport cost (in the case of inland refineries) was calculated from the railage rates, and later the pipeline tariffs, of the state transport company Transnet[14]. These tariffs were not regulated until the beginning of the 21st century.

The IBLC mechanism has given South African refiners an economic advantage in a number of ways, given the bar on importing fuel (see below). The concept of import parity pricing conveys an obvious inherent advantage; in addition to this, key elements of the IBLC have been singled out as

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[12] The new refineries were the Mobil refinery in Singapore, the Esso refinery in Singapore, the Singapore Petroleum Company refinery, and the Caltex refinery in Bahrain; since Mobil had disinvested, this list included only one refinery owned by a company operating in South Africa. Platt's issues a series of key publications on the oil industry, including regular price information, which is widely used in the oil industry for reference purposes.

[13] The following account of the current pricing system is a summary and does not deal with some of the more technical issues, which include deriving prices for non-listed South African products, a 'slate' mechanism to allow for daily price movements while changing the fuel price only once a month, and other technical issues such as sources of information. See Department of Minerals and Energy website www.dme.gov.za for more details)

[14] Trains were operated by South African Railways, later Spoornet, and pipelines by Petronet, both subsidiaries of Transnet.

conferring further advantages at various times, resulting in a price significantly above import parity. Three elements of the pricing system have been singled out by critics. The first was the choice, post-1973, of a majority of Singapore refineries as reference refineries, which had three inflating effects on the IBLC. The first was that

> "..there is a clear price differential between Singapore and the [Arab] Gulf of about US$2.80 per barrel.. ..indeed, Singapore turns out to be one of the most expensive refining areas from which to buy fuel (Lloyd 2001:17),

which translated into a difference of around 13c/l in 1997. The second effect was that since Singapore is considerably further from Durban than the Arab Gulf or the Mediterranean, the shipping element in the IBLC was considerably higher, which added around 2c/l (1997) (Lloyd 2001:18). The third objection to Singapore reference prices was that the refining industry in Singapore is based on diesel rather than petrol, for which the market is less-well developed and less fluid (and therefore prices are higher), whereas petrol was and is the most important aspect of the South African market (CS).

The second element was the use of posted prices (100% pre-1994, 80% 1994-2002, and none thereafter), as opposed to spot prices. Posted prices were the standard pricing mechanism for export refineries from the 1950s to the 1970s, when a spot market in liquid fuels was established: posted prices thereafter more accurately reflected offering prices from refineries, rather than selling prices, and most sales were conducted at spot prices. As a result, posted prices were on average 10c/l higher than spot prices in 1997 in the Singapore market (Lloyd 2001:17), and around 12c/l higher in the Arab gulf market (CS[15]), which comprised around 13% of the IBLC at the time, or around 6% of the retail petrol price. Together, these premiums comprised one third of the IBLC, or around 12% of the retail petrol price. The third critique of the IBLC was directed at the freight rates, which were based on vessels of less than 25 000 tons, which were widely used in the 1950s for transporting liquid fuels, but phased out in favour of larger vessels from the 1960s onwards. From 1994 on, rates applicable to vessels between 25 000 and 50 000 tons were used, which is closer to the vessel size which would actually be used to import liquid fuels, given the economies of scale and characteristics of South African ports; this change decreased the IBLC by around 5c/l (Lloyd 2001:18).

The history of the IBLC at the height of the oil embargo (from 1978 to 1991) is more obscure. Davie suggests that the non-transparency of pricing mechanisms was exploited in the 1980s to boost the profitability of Sasol when crude prices were low, quoting premiums of up to $11/barrel over

[15] Confidential Source. The author has taken steps to verify the reliability of the information attributed as CS, but the source is not in the public domain due to unnecessary secrecy still surrounding the liquid fuels policy process.

Rotterdam prices, or an average of $5.80 (1991 prices) higher during the 1980s (Davie 1995:245), which is an average premium of 20c/l in 2000 cents, or an average of 6% of the retail petrol price. The above comparisons are of little statistical value because they are derived from a small set of points in a complex and fluctuating market; nevertheless, they would seem to indicate that the refining industry in South Africa has been very profitable since its inception. Although a thorough financial analysis would be necessary to confirm this, it was an opinion widely held by interviewees from both the oil industry and by senior bureaucrats who were involved in regulating the industry in the 1970s and 1980s, who repeatedly made the point that the industry was able to make significant profits when the international refining industry was operating at a loss, which indicated that refinery returns were significantly higher in South Africa than elsewhere. This was confirmed by government studies in the 1990s, which reported that South African refinery margins were consistently higher than elsewhere (CS). The IEA observed in its report on South African energy policy that the non-tax component of the South African petrol price was exceeded in the OECD by only three countries (IEA 1996b:195), although this figure includes wholesale and retail margins as well.

Transport and Pipeline Tariffs

The transport element in liquid fuels prices is calculated by dividing the country into a number of zones. A transport cost is then worked out for each zone, on the assumption that all liquid fuels are transported from one of several large ports, using a mixture of rail and pipeline tariffs, which were set by the state railway and pipeline parastatals. For several decades these transport rates were inflated, and the surplus used to cross-subsidise other railway services (Lloyd 2001:25, Interview with S. Van Den Berg). Given the importance of the pipeline network, tariff levels had a significant impact on liquid fuels prices. From the late 1960s, when the pipeline network began operating, it earned massive profits; a Board of Trade and Industry inquiry into the petrol price in 1977 noted that

> "..it was clear from the evidence that roughly two-thirds of the price differential between the Transvaal and the coast can be attributed to the marked difference between Railway pipeline tariffs for oil fuels and the actual cost of conveyance by pipeline.." (Board of Trade and Industries 1978b:14).

Pipeline revenue for 1976 and 1977 is recorded as R71.6 million and R88 million respectively, whereas expenditure, including interest, depreciation and operating expenses, was a mere R10 million and R14 million respectively, implying a profit margin of between 600% and 700%. The BTI noted that the transport element in fuel prices was the only element which was not in any way market-related. After the 1970s, there is no reliable information on pipeline profits. The DMEA themselves did not have access to this information, and tried for years to take the issue to Cabinet

without success (Interview with S Van Den Berg). Van Den Berg explained the cause of high tariffs throughout the 1980s and 1990s in terms of the social role that the railways played in limiting white unemployment; as a result, the pipeline network was the only profitable part of Transnet. When Transnet was restructured in the early 1990s, it incurred massive pension liabilities, at which time the pipeline network became a crucial source of revenue. From the early 1970s to 1998, transport costs comprised around 10% of the petrol price. If one assumes that 80% of this consists of pipeline charges (given the structure of the market, and the inclusion of a transport element in the refinery gate price of the inland producers), a reduction of profit margins to a more reasonable 20% would involve a drop in tariffs of around 80% (based on the 1970s figures quoted above), which would have implied a 6% average drop in liquid fuels prices. Currently a new Pipelines Regulator is being established to regulate pipeline charges.

Import Restrictions, 'Tariff Protection' and Subsidies, and Taxes and Levies

Protection in various forms has been a central feature of liquid fuels policy, and has its roots in the 1930s, when 'tariff protection' was granted to the SATMAR plant, at the time the only source of domestically-manufactured liquid fuels; this consisted of a reduction in excise duty (payable on imported fuel) paid by SATMAR to the state, which was effectively a form of import duty on liquid fuels, or 'tariff protection' (Van den Berg 1993:44). Similar protection was afforded to Sasol 1 when it began operations in the 1950s, and a lower rate of protection was applied to local refineries. Control over the import and export of both crude oil and refined products via a permit system was introduced during the second world war in terms of War Measures 146/1942, the War Measures Continuation Act (1956), and entrenched in terms of the Import and Export Control Act (45/1963), which in terms of regulations pertaining to the liquid fuels industry, required a permit to be issued for the import or export of any crude oil or liquid fuel. From the 1960s onwards, stringent conditions were imposed on the granting of import permits, which were linked from the late 1970s to the 'upliftment' of the production of the synthetic fuels industry; companies not party to 'upliftment' agreements were excluded from importing liquid fuels; thus only a limited number of companies directly involved in the liquid fuels industry were eligible. Liquid fuels could only be imported if locally refined/produced liquid fuels were not available (Department of Minerals and Energy 1999:2). Thus, access to the international liquid fuels market was limited to existing refining and marketing companies (and included the synthetic fuels industry), and competition from imported fuels was thus prevented, which the state rationalised in terms of the regulatory system. As a DME internal policy document stated in 1999: "..the entire current regulatory system is dependent on effective import control" (Department of Minerals and Energy 1999:1). These import restrictions rendered tariff protection to crude refineries almost irrelevant, but tariff protection for

the synthetic fuels industry effectively became a subsidy, since the 'tariff protection' did not primarily differentiate the synthetic fuels industry's product from imported product, but from locally-refined product (since by 1966, imported product comprised a tiny proportion of the liquid fuels market). The case for considering subsidy payments in this way was that these were funded from a levy, the 'equalisation levy'; however the actual mechanism involved exempting Sasol products from this levy to the amount of the subsidy, thus allowing Sasol to recover the subsidy through premiums gained by selling liquid fuels to marketers at the ordinary taxed rate, which is economically equivalent to a subsidy being paid directly from the Equalisation Fund, which is in turn funded by consumers of liquid fuels. Thus the subsidy was paid by liquid fuels consumers to Sasol, and had a direct effect on prices. This impact was negligible when it only applied to Sasol 1, which represented a small fraction of fuels sold on the local market (a maximum of 4% by 1970), but became very significant when the subsidy was extended to Sasol 2 and 3.

The subsidy was allocated as a fixed sum per litre of product (except for a period in 1985-86 when the oil price was too high to justify a subsidy), until 1989, when a new mechanism was put in place to cater for oil price fluctuations: a 'derived crude price' per barrel was calculated from the IBLC, and a 'floor price' of $23 per barrel was set; if the 'derived crude price' dropped below the floor price, Sasol received a subsidy, which was then calculated to compensate Sasol for the difference between the IBLC price and a theoretical IBLC price which would result from a crude price of $23 per barrel (Van den Berg 1993:44, Arthur Andersen 1995:37-8). In exchange for this subsidy, in theory Sasol was required to pay a portion of its profits back to the state if the derived crude price rose above $28 a barrel; however, following a decision in 1995, the floor price was reduced to $16 over a four-year period, and was phased out by 1999. The implication of this subsidy formula was that Sasol sold its liquid fuels products for a "..reasonably constant price [in US c/l].. ..which corresponds to the crude oil floor price" (Arthur Andersen 1995:37). From 1980 to 1994, Sasol received a total subsidy of R14.1 billion in 2000 rands (calculated from Trollip 1996:4-28).

There were in addition a number of informal subsidies of which Sasol was a beneficiary because of the structure of the regulatory system. The key benefit came from the structure of the IBLC, which involved adding a transport element to the IBLC for Sasol's and Natref's product, as if it were imported from the coast. Since this was linked to pipeline tariffs, maintaining high pipeline tariffs was an additional way of subsidising both Sasol's synfuels and ordinary production, since marketers were obliged in terms of the Crude Refiners' Agreement to buy Sasol's product, and at the regulated price. Another informal subsidy of Natref's production took place through the 'Natref Neutrality' principle for pipeline tariffs, whereby pipeline rates for crude oil transport inland (to strategic stocks and to Natref) were discounted, but rates for shipping products inland were inflated.

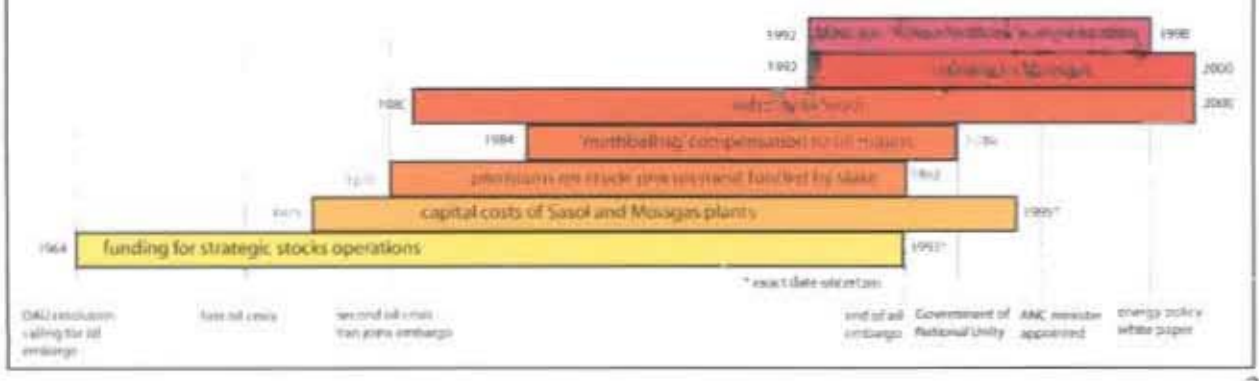
Subsidies were part of a complicated tax system which evolved considerably from the 1950s to the end of the century, and included a shifting set of levies, funds and taxes; these included tax components which went to the general fiscus (not being energy policy-related), which will not be discussed here, except to note that South African liquid fuels taxes are relatively low by international standards, and that general taxes on liquid fuels were relatively constant. The energy policy-related levies were all related to the state's oil security strategy, and were first imposed in the 1960s, and finally withdrawn in the 1990s.

The easiest way to understand the development of these taxes and levies which formed part of liquid fuels prices is in terms of three levels. The first level consists of a series of dedicated levies added to the fuel price at various times. The second level consists of the way in which the levies were added to the fuel price, and the third level consists of a number of financial instruments through which the levies were channelled. For instance, the strategic stocks levy (level 1) was collected through customs and excise taxes (level 2), and channelled through the Strategic Fuel Fund (level 3). Figure 6.8 below indicates the date of inception and duration of each levy (level 1).

The first levy to be imposed in 1964 was to fund a strategic crude stock, which was partly funded by parliamentary grants and partly from fuel levies via excise taxes, a portion of which was paid into the SFF. Due to secrecy provisions, it is not clear what it cost, and how this cost was divided between the fiscus and liquid fuels consumers. During the period 1988-1995, stocks were gradually run down from around 20 months' requirements to around 4. The peak value in 2000 rands of the strategic stockpile during this period was R17 billion (calculated from Trollip 1996:4-18, using Brent crude prices). Levies ceased in 1993 when the oil embargo was lifted.

The second levy to be imposed from 1975, initially through excise taxes and then through a dedicated State Oil Fund (SOF) and later Central Energy Fund (CEF) levy, financed part of the capital costs of Sasol 2 and 3 and Mossgas through these Funds. The financing for Sasol 2 consisted of (in nominal rands) R492 million from export credits, R300 million from parliamentary grants, and R1711 million from the State Oil Fund, and for Sasol 3 R655 million in export credits, R525 million from the privatisation of Sasol 1, and R2096 million from parliamentary grants and the SOF

Figure 6.8: State Oil Security Strategy-Related Levies Added to Liquid Fuels Prices



(no information on how this was divided) (Financial Mail 16/11/1979). Government grants and SOF money were allegedly in the form of soft loans, which were repaid partially through a privatisation process (Van den Berg 1993:37-38); interest rates for the remaining loans were linked inversely to the 'derived crude' price after 1989 (Arthur Andersen 1995:35-38). Similarly, Mossgas was financed largely by the CEF, which provided around R7.4 billion (nominal) of an estimated total of R11 billion (Financial Mail 3/1/1992). Levies ceased around 1995.

The third levy to be imposed from 1979 was to fund the 'Acquisition Equalisation Fund' (later the Equalisation Fund), to cover the premium on crude oil acquisition that the country was forced to pay after the 1979 oil crisis (Financial Mail 22/12/1978). It was levied through an Equalisation Fund levy, and paid into the Equalisation Fund. In this year, the state took over the acquisition of crude oil[16] on behalf of the refining industry, bought crude at the lowest price possible (usually at a significant premium; estimates rage from $5 to $20 in the early 1980s (Davie 1995:249-50)), and sold it to refiners at an average international price. P.W. Botha claimed in 1986 that crude oil acquisition had cost the country R22 billion (R89 billion in 2000 rands) more than it would if it had been acquired in the normal way (Hengeveld & Rodenburg 1995a:202), which comprised the premium which the state funded from the Equalisation Fund, and possibly includes premiums paid on strategic stocks purchases. Assuming the premiums began in 1979, and that the crude purchases covered all requirements and two years' strategic stocks, this figure would imply an average premium of $19 per barrel at contemporary exchange rates; although this is plausible, it seems high even under the circumstances then prevailing. Towards the end of the 1980s, the premium declined as the embargo became less effective, the world market developed a glut, prices fell, and the SFF traders developed better acquisition strategies. Levies ceased at the end of the oil embargo, when procurement reverted to the state.

The fourth and sixth levies, from 1980 and 1992 respectively, comprised subsidies to Sasol and Mossgas, which were collected and paid through the Equalisation Fund (Trollip 1996:4-29). Both subsidies ceased in 2000. The fifth levy was imposed to fund payments made to refiners to compensate them for the loss of refining capacity mothballed as a result of Sasol 2 and 3, which begun around 1984, and ended around 10 years later; payments were funded from a fuel levy, and totalled R1.267 billion in 1993 (in nominal rands – Van den Berg 1993:41), or R4.47 billion in 2000 rands[17]. The collective impact of these levies can be clearly seen in Figure 6.9 below

[16] With the exception of one refiner, which acquired crude through an international subsidiary.

[17] This calculation assumes that the total sum was distributed throughout the period mentioned, and declined throughout, as demand rose and equipment was demothballed.

The Wholesale Margin

The regulation of wholesale margins in South Africa began in 1946, when fuel was imported at relatively fixed prices, inflation was low, and there was long-term stability in the oil price. It was imposed in terms of War Measures 49 of 1946 to control excess profits by the oil companies in the wake of the war. The repeal of these measures shortly afterwards led to a "gentleman's agreement" between industry and government, in terms of which a fixed margin was specified on different products (Van den Berg 1993:28). This was maintained almost unchanged until 1964, when the price control system was formalised in terms of the Price Control Act.

The IBLC was integrated with the wholesale margin from 1984, when a new Petroleum Activities Return (PAR) mechanism was implemented, whereby a margin was set on a rate-of-return basis for both refining and wholesale activities together; thus the wholesale price was set so that oil companies would earn a return of 15% on both their refining and marketing assets. In 1991, at the request of the oil companies, refinery margins were 'deregulated', and a new Marketing Petroleum Activities Return (MPAR) mechanism was introduced, which calculated a margin based on a return on marketing assets only, also aimed at giving companies a 15% return. The rate of return is calculated on the combined assets of the whole industry.

The Retail Margin

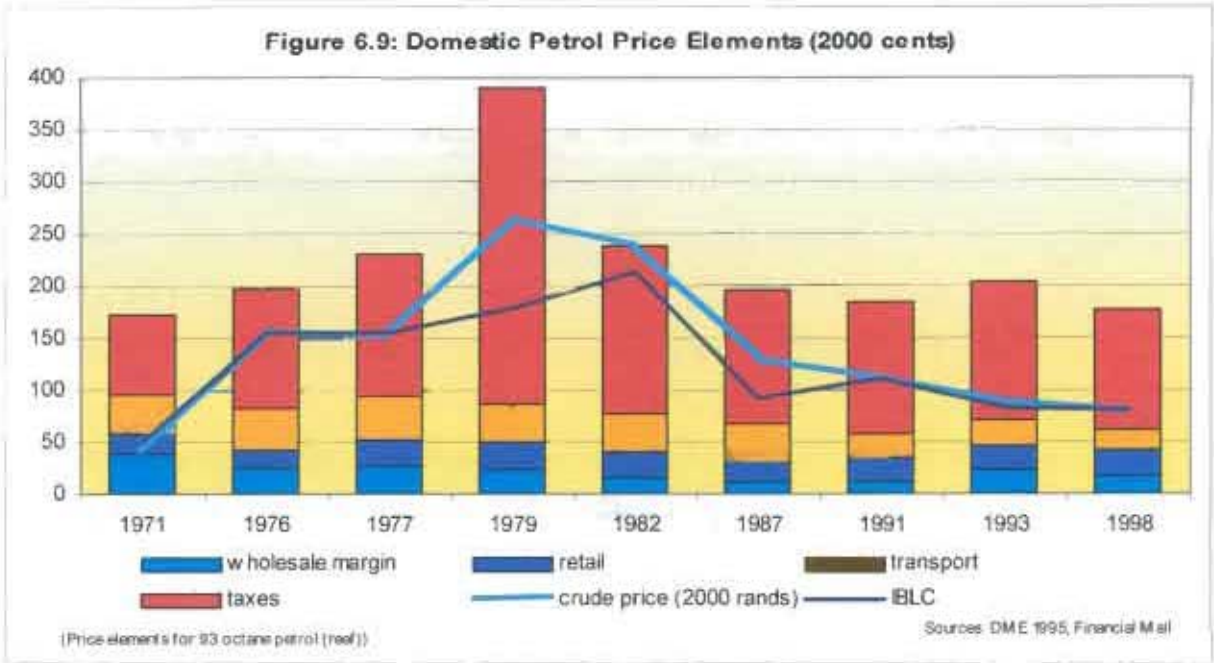
The retail margin is calculated on a similar basis in negotiation with the MIF, and applies only to petrol.

Historical Impact of Price Elements

Since the basic fuel cost (IBLC) in the petrol price is tied to fluctuations in external influences (international oil price and the rand/dollar exchange rate), price movements are better analysed by separating this element from other elements determined domestically, which has been done in Figure 6.9 above, which reflects real values of petrol price elements from 1971 to 1998[18], as well as the IBLC and the crude price, both in South African currency. Changes in the IBLC obviously follow the trends of the oil price[19].

[18] Irregular intervals in the graph are due to lack of information on price elements, which is now available back to 1987 (Department of Minerals and Energy 2001b), but only sporadically before this.

[19] The *exact* coincidence of the lines on the graph is exactly that, since the IBLC is in 2000 cents per litre, whereas the crude price is in 2000 rands per barrel.

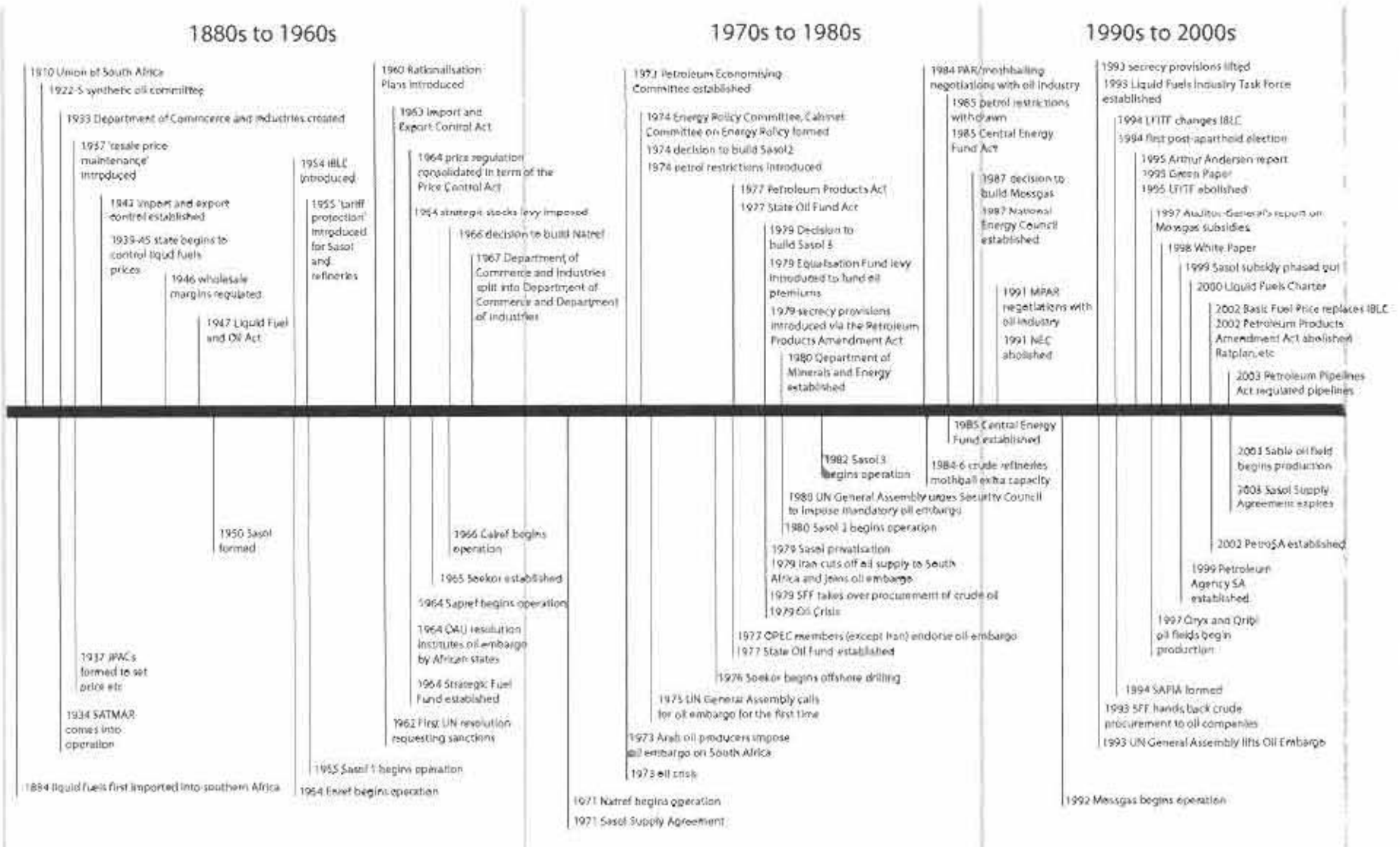


The most striking non-IBLC component of the price is the government tax component. This increased dramatically in real terms from the first to the second oil crisis, and doubled in 1979; this rapid increase was related both to the funding requirements of Sasol, and to the need to fund crude oil premiums which arose abruptly in 1979, as Iran stopped providing oil to South Africa in the wake of the overthrow of the Shah. Other notable trends are the decline of the wholesale margin from 1971 to 1991, when the PAR mechanism was replaced by the MPAR mechanism, and the decline in transport tariffs from 1991 to 1998. This does not imply that oil industry margins actually decreased during this period, since in 1984 a lower margin increase was accepted by the oil industry in exchange for the mothballed capacity payments.

The Development of Liquid Fuels Policy

The development of liquid fuels policy in South Africa can be divided into three overlapping phases; the key policy developments and associated events are portrayed in Figure 6.10 below. The first, from the 1920s to the early 1970s, saw the establishment of the regulatory framework and the development of a privately-owned refining and marketing industry and a small-scale state-owned liquid fuels industry. In the second phase, from the 1960s to the 1990s, the threat of an oil embargo led the state to develop an oil security strategy, which involved significant involvement by state agencies in the liquid fuels industry, including the development of a large-scale synthetic fuels industry, a state-owned inland refinery, and the takeover of oil procurement for the refining industry. These developments required considerable regulatory innovation, which nevertheless occurred within the previous regulatory framework, as well as a significant institutional transformation. The newly-formed nexus between coal and liquid fuels, via the synthetic fuels programme, and the strategic impetus for the state to reduce the country's reliance on crude oil,

Figure 6.10: Key Policy-related Developments in the Liquid Fuels Sector



placed liquid fuels policy in a newly-developed energy policy context. Decision-making was shifted from its previous policy context to an energy policy context, accompanied by a process of bureaucratic reorganisation.

The end of apartheid heralded the third phase, which began with the cessation of the oil embargo and the transitional negotiation process. Policy-making was aimed chiefly at promoting racial equity in ownership and control of the industry, and at the formalisation of the apartheid-era regulatory framework: the basic regulatory principles were maintained, but the web of informal agreements which had formed the basis of the regulatory system was dismantled.

1) 1920s to 1970s

There were two strands in the state's liquid fuels policy from 1910 to the 1960s. The first was the regulation of the retail trade, and the second was the promotion of industrial development in the liquid fuels sector, which included the sponsoring of a synthetic fuels industry. The retail trade was regulated with the aim of promoting a low and stable petrol price coupled with high levels of service and availability, and the state was prepared forego the benefits of a competitive market to achieve these goals. The regulation of the manufacturing industries was based on encouraging industrialisation and utilisation of indigenous resources, and was developed within the context of the existing retail regulatory system. Together, these elements contributed to the development of a regulatory framework which was fully elaborated by the 1960s, and included as its main features regulation of the whole value chain, a raft of protectionist measures for both the marketing and refining industries, and a high degree of co-operation amongst industry actors, and between industry and government. This regulatory framework set the basic parameters for the development of the state's oil security strategy, as well as for post-apartheid liquid fuels policy, which has as yet not challenged its basic parameters.

The roots of regulation: retail regulation from the 30s to the 70s[20]

Regulation of the service station industry has been the province of the Department of Commerce and Industry, and specifically by the branch of the Department that dealt with trade, commerce and price regulation, with a significant role played by the Board of Trade and Industry, from 1933; from 1967 to 1980 it was regulated by the Department of Commerce, and from 1980 onwards by the Department of Mineral and Energy Affairs. The key feature of retail regulation of petroleum products was a process, beginning in the 1930s and culminating in the Rationalisation Plans beginning in the 1960s, of granting petrol retailing a special status within the economy, governed by

[20] The history of the early development of retail trade regulation is largely based on Van Den Berg (1993), which is currently the only comprehensive account of the period.

a web of informal agreements with industry. The main characteristic of this status was the suspension of competition law or principles, and the co-operative relationship of the main industry players. While this was common in the South African economy in various industries in its early phases, the outstanding characteristic of the liquid fuels industry is the duration of this status, which for various reasons exempted the industry from competition legislation until the late 1990s.

The key impetus for this process was the state's quest to promote a viable service station industry which provided both high levels of service (both in respect of providing liquid fuels and in providing other car-related services, including sales and repairs), and a low and stable petrol price; thus, until the 1950s, liquid fuels regulation was subsumed into regulation of the service station industry. Thus, the source of the industry's special status, and the focus of early policy development, was the unique properties of petrol as a commodity: it was difficult and unsafe to handle, and was a low-value, high-volume commodity, and thus entering the market entailed a relatively high capital cost (for storage and pumping equipment). The early industry solved these problems by fixing prices, the outcome of a co-operative arrangement between service station operators (organised into the MTA) and the oil majors, which was sanctioned by the state's nascent competition authority, the Board of Trade and Industries, in a 1923 report (BTI report 14, 1923, Van den Berg 1993:6)

Under new competition legislation (the Unlawful Determination of Prices Act, 1931), the state outlawed petrol price setting, and competition ensued. Competition led to the closure of service stations and declining levels of service to motorists, and another two BTI investigations followed (157/1933, 204/1936), which emphasised the negative effects of price competition and allowed the oil companies and the MTA to set prices again, as well as determine the number and location of services stations, enforced through the supply chain by the oil companies, which cut supplies to non-conforming outlets (Van den Berg 1993:6). Price control and service station location was controlled through Joint Petrol Advisory Committees (JPACS), consisting of oil industry and MTA representatives. The tight control of the industry by the JPACs led to the appointment of a National Appeals Board in 1947, which was ineffective, and public pressure triggered another BTI investigation, which submitted its report in 1950 (BTI 316/1950), and rejected the need for control of service station locations and numbers.

The BTI's recommendations were implemented in terms of regulations under the Undue Restraint of Trade Act (1950), which replaced the JPACs with a set of standards to be complied with by service stations (Van den Berg 1993:8). The regulations were found to be 'inflexible' and withdrawn later in 1950. Instead, the oil companies (who could control new entrants through supply) undertook to implement the 'spirit' of the regulations. The other key innovation of the 1950s was the development of the 'single brand' system. Previously, service stations had sold a

number of different oil companies' products on their forecourts; from the 1950s onwards, each service station sold only one oil company's liquid fuels, which cut distribution and capital costs, but necessitated the allocation of service station sites between companies. Although companies owned many sites, they were prevented from operating more than a handful of sites for training purposes. The 'single-brand' system was endorsed by another BTI report tabled in 1958.

The proliferation of service stations (under the informally implemented UROTA regulations) posed a problem for the oil companies (who had agreed to install pumping equipment at any qualifying service station), and the MTA (proliferation caused throughput to fall, thus leading to uneconomic sites). Thus the Department of Commerce and Industry, the oil companies and the MTA pioneered a Rationalisation Plan in 1960. A new plan was agreed and approved periodically, usually every 4 to 5 years, until the 1990s. The formal function of the 'Ratplans' was to rationalise service station numbers and location by agreement between the oil industry, the Department of Commerce and Industry, and the MTA/MIF, to maintain national accessibility to fuel while maintaining service station standards and economies of scale (Van den Berg 1993:17-21). The actual activity carried out under the plan was to institute a set of procedures for allocating service stations, and thus market share, between oil majors involved in marketing, by awarding each company a 'quota' of sites, and to guarantee individual sites a high throughput. The plan was not formalised through regulation or legislation, and compliance was enforced through the threat of non-supply. At the same time, new entrants to the market (after 1960, Sonarep, Trek and Esso, and others in the 1990s) could gain sites either from government or oil industry patronage, given the constantly expanding market.

The control of the retail price was first undertaken by the industry itself, and then, after regulation of the wholesale and retail price during the second world war through various War Measures, through a series of 'arrangements' between government and the oil industry (Financial Mail 10/12/1976, Van den Berg 1993:28). Since 1964 prices were regulated in terms of the Price Control Act, in terms of which, instead of stipulating prices legislatively or by regulations, the Price Controller concluded

> "..an agreement with a specific manufacturer or a group of manufacturers of an industry in terms of which the manufacturer or industry undertakes not to increase his or its prices without the prior approval of the Price Controller" (Financial Mail 10/12/1976),

which was the case with petrol and other liquid fuels. From 1977, price control was administered in terms of the Petroleum Products Act (120/1977), which will be discussed further below. The only serious challenge to the web of informal relationships which regulated the retail industry was in 1970, when the BTI launched a wide-ranging inquiry into 'resale price maintenance' in a spread of industries across the economy, and recommended to the Minister that the MIF's application for exemption from a notice abolishing retail price maintenance be rejected. The Minister demurred,

and rejected the recommendation (Financial Mail 28/8/1970), on grounds which included concerns that abolition of price control would jeopardise the functioning of the Ratplan. The liquid fuels industry was thus excluded from a shift in general competition and regulation policy, and removed from the BTI's and subsequent competition authorities' influence. Whereas the industry's early 'special' status had developed in the context of the economic challenges posed by the early development of the industry, from the late 1960s, this was augmented by an acute awareness within the state that the industry distributed a strategic commodity.

Refining, Synthetic Fuels and Regulation

State interest in indigenous liquid fuels production in South Africa followed three different paths. The first, and oldest, was an interest in developing an industry which would use local raw materials to develop liquid fuels. The second was a keen interest in encouraging oil majors to establish refineries in South Africa, and the third was to encourage the development of an indigenous (and preferably Afrikaans-dominated) integrated oil company.

Interest by private capital in various production processes utilising South African raw materials began before the Act of Union, with the establishment of the Natal Mineral Oil Company, which aimed to extract illuminating paraffin from torbanite. The 1910s saw the development of oil shale mining (but no processing) in Natal and the Transvaal (Fine & Rustomjee 1996:140). The state's interest in producing liquid fuels from indigenous resources can be traced to the appointment of a committee in 1922, consisting of, amongst others, the Government Mining Engineer Robert Kotze and chairman of Escom, Hendrik Van Der Bijl (later head of the IDC and Escom), which was tasked with investigating "..the possibility of carbonising South African coal for the production of motor fuels" (South African Yearbook 1925:533), as well as investigating the possibility for manufacturing liquid fuels from South African deposits of oil shale. The Committee reported in 1925[21] that South Africa possessed a significant coal and oil shale resource, and that a South African industry could be established with government assistance, given its proximity to a potential inland market by comparison to imported fuels (South African Yearbook 1925:533).

A large mining house, Anglovaal, did in fact establish an oil-shale mining and refining venture in 1934, the South African Torbanite Mining and Refining Company (SATMAR), which distilled a synthetic crude from oil shale, and refined it and crude oil in a small refinery (Fine & Rustomjee 1996:140), and received a subsidy in the form of 'tariff protection' of around 20% of the sale price of the fuel (Van Den Berg 1993:45). After the second world war, enthusiasm for a larger synthetic fuels programme was kindled in government, fuelled from two sources. The first was a post-war

[21] Various sources report that a White Paper on synthetic fuels was tabled in 1927, written by a Dr Meyer; however there is no official record of such a White Paper being tabled in parliament. In addition Dr Meyer was allegedly an advisor to the Department of Commerce and Industry in 1927, which was only formed in 1933 (see for instance Collings 2002:15)

industrialisation strategy led by the IDC and based on import substitution-industrialisation (Clark 1994:160-1), and the second was a recommendation from the 1946-7 Coal Commission, whose brief, aside from the key task of investigating coking coal resources, was to

> "..marshal and report upon.. any further measures necessary to secure the greatest amount of utilisation of the coal resources of the Union of South Africa" (1946-47 Coal Commission:1).

One of the Commission's key concerns was the under-utilisation of the massive reserves of low-grade coal in South Africa, and the Report observed that

> "....coal-oil plants would form a use for much of the low-grade coal now left behind in many of the collieries, and for the large reserves of low-grade coal in the Union" (1946-47 Coal Commission:94),

and noted in its conclusions and recommendations that a synthetic fuels industry

> "..will therefore contribute substantially to the utilisation of low-grade coal in the Union of South Africa, of which there are colossal reserves" (1946-47 Coal Commission:144).

While the Commission was sitting, parliament passed the Liquid Fuel and Oil Act (49/1947), the aim of which was to "..regulate and control the manufacture of liquid fuel from coal" (Liquid Fuel and Oil Act 49/1947:Aims), which included the granting of extensive powers to the Minister of Economic Affairs to prescribe various aspects of the operation, including maximum price, product mix, and the type of coal used. Most importantly, parties wishing to develop synthetic fuels businesses needed a licence from the Minister.

Clark has perceptively suggested that the brief history of the development of the synthetic fuels industry in South Africa, from the Act to the establishment of Sasol, followed a similar course to the development of Iscor (Clark 1994:160). The original intention of the Smuts government was to license a private entrepreneur to undertake the initial project; the potential entrepreneur in the shape of Anglovaal, was granted a license in 1949, but a combination of factors, including capital requirements for the development of the new Free State gold fields, the refusal of the state to guarantee loans, and the devaluation of the South African Pound[22] in 1949 (which in turn boosted returns on gold) led Anglovaal to abandon the venture (Collings 2002:16). By this time the Nationalist government had come to power, with a stronger ideological commitment to self-sufficiency and state-led development. Although as late as 1950, the Minister of Economic Affairs was still recommending that the state raise a loan on behalf of Anglovaal, the proposal was dropped because of potential parliamentary opposition (from his own party – Clark 1994:161). A committee of inquiry was established which went on a study tour of Europe to assess the appropriateness of various synthetic fuels technologies, and recommended to government that a state-owned company be formed to develop a synthetic fuels industry (Collings 2002:16-17).

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[22] The South African Pound was the official South African currency until 1961, when South Africa switched to the rand, which was valued at 0.5 Pounds at the switchover.

The company, the South African Coal, Oil and Gas Corporation (Sasol for short) was formed in 1950, and funded by the state via the IDC, to avoid the problems which Iscor had experienced in its development phase, involving large interest payments before its production reached economic levels. In the case of Sasol, this was an even greater problem, since

> "..neither the IDC nor the government's technical advisors had a clear idea of exactly how much capital would be necessary to get the operation going on a sound basis, and none knew what sort of a profit could be expected" (Clark 1994:161).

The project's cost escalated from an original 18 million South African pounds to 33 million pounds in 1953 (R1.6 billion, and R2.6 billion in 2000 rands), to which the Finance Minister remarked that he would have turned the scheme down if he had assessed it on the higher figure (Clark 1994:162). The total output of Sasol was insignificant: its initial capacity was equivalent to 5000 barrels/day, and later expanded to 10 000 barrels/day in the 1960s, whereas consumption of liquid fuels in South Africa required a refining capacity of around 80 000 barrels/day in 1955, and 320 000 barrels/day in 1973. Thus, Sasol's output represented around 6% of local requirements in 1955, and around 3% in 1973[23]. The motivation to construct Sasol 1 was thus not based on oil security considerations, but rather a number of other factors, including coal and industrial policy, as well as an assessment of world oil reserves (which were thought to be scarcer), the lack of other refineries in the country at the time (although Enref was completed in 1954), and the advantage of the plant's location adjacent to the major South African market. Sasol received the same subsidy as SATMAR production (2 pence per gallon) but lack of pricing data makes it difficult to assess the impact of the subsidy. The company began to make a profit in the 1960s, and diversified into petrochemicals, a high-value market for Sasol on account of the unique properties of the synthetic fuels process. In 1990, with Sasol 2 and 3 fully operational, and with a potential end to the oil embargo in sight, Sasol 1 was converted into a petrochemicals plant.

The marketing arrangement which Sasol made with the oil majors (the 'Blue Pump' agreement) was that one Sasol pump would be placed on each service station within a specific geographical area, through which Sasol would market its product. The agreement was embedded in the new 'single brand' system, at government's insistence, in the mid-1950s, and persisted until the 1980s.

The crude refining industry developed from the 1950s, as outlined above, with the erection of three refineries (Enref 1954, Sapref 1964, Calref 1966) in the 1950s and 1960s (the fourth crude refinery, Natref (1971) has been dealt with in the next section). The development of the refining industry continued from the 1950s to the 1970s, with major expansions in capacity in 1970 (Calref, Enref),

[23] Figures for demand of refining capacity are based on Department of Mineral and Energy Affairs (1995) figures for crude oil consumption by refineries (including derived figures for imports), and may well be inaccurate.

1971 (Sapref), 1973 (Sapref), 1975 (Enref), 1976 (Natref), 1977 (Sapref) and 1978 (Calref)[24]. Policy towards the refining industry was very favourable, for a number of different reasons. In the 1950s, the development of refineries promoted industrial development goals of import-substitution, as well as having very positive linkages with other industrial sectors such as chemicals; thus the original regulatory regime for setting refinery gate prices was based on three principles: the first was import substitution on very favourable terms, via the IBLC formula outlined above; the second was import restrictions, also outlined above, which were also rigidly applied to only allow imports by oil majors, and only when there was a demonstrable shortage of local production, as well as a preferential tariff on locally-refined fuels[25]; and the third was a restriction on the construction and expansion of refineries, which under industrial development regulations required a licence, which in turn required the applicant to demonstrate the necessity of more refining capacity in terms of local demand; refinery expansion plans were frequently negotiated with the relevant Minister. Since South African refineries' supply envelope also included most of southern Africa, this provision ensured a significant degree of protection from competition, and made it even more unlikely that another refiner would enter the market (Interview with S Van Den Berg).

The state's approach to the oil industry underwent a significant change from the 1950s to the 1970s. During the 1950s, industrialisation policy encouraged refinery development and expansion; with the maturity of the industry in the 1960s, given the growth in demand (premised on a stable and low international oil price, coupled with high domestic growth rates), both the state and the oil industry expected a new refinery to be a necessity in the 1970s. During the 1960s the state began to take an interest in promoting a significant indigenous stake in oil companies; this, coupled with the 1960s phase of the state's oil security strategy, which appeared to be moving in the direction of a large state-owned oil company ("State Moves in on Oil" (Financial Mail 15/12/1966; see also Financial Mail 23/3/1967)), persuaded oil majors that there was a danger of some form of nationalisation (Interview with senior oil industry executive).

A new refinery was anticipated in the mid-1970s, which would require a licence from the state. As a precautionary move, Shell and BP formed a joint marketing company, Trek, in the 1960s with Genmin (an Afrikaner mining house), in order to gain a stake in the new refinery, and were subsequently granted a licence (Interview with senior oil industry executive). Moreover, the government began using the Ratplan from the late 1960s to promote marketing companies with indigenous shareholding; the 1969-1972 Ratplan gave preference in the allocation of new sites to "companies 'who have promoted participation of SA capital and enterprise in the manufacture and marketing of petrol products'" (Financial Mail 1/11/1968), a clear reference to Trek and its backers.

[24] This data has kindly been provided to me by Dave Wallace from BP.

[25] There was effectively a duty on imported fuels not applicable to locally refined fuels, which amounted to around ¼ of the Sasol subsidy in the 1950s (Van den Berg 1993:40)

The new refinery was to be built at Richards' Bay north of Durban, a deep-water port then under development by the IDC and capable of berthing VLCCs. The crude pipeline to supply Natref was routed via Empangeni near Richards' Bay with this in mind, as was a new liquid fuels products pipeline in the 1970s (Financial Mail 5/3/1971). Since Richards' Bay was under development as a major industrial hub at the time, the IDC saw a refinery as a natural addition, which would also be linked to the inland strategic crude storage network, and potentially form a hub for a petrochemicals industry. After 1973, however, the development of Sasol 2 meant that with existing refinery expansion programmes, the petrol restrictions introduced in 1974, and a general drop in demand due to high prices, more capacity was not required. No further crude refineries have been built in South Africa.

In the 1960s, oil industry interviewees described the oil majors "kowtowing" to government, for the reasons outlined above. By the end of the 1970s, the position had reversed; the South African government desperately needed the oil majors not to disinvest, and deployed a number of incentives to prevent this from happening, including offering coal export concessions[26] to oil majors which continued to "fulfil their obligations in supplying liquid petroleum fuels in the country" (Economic Affairs Minister Chris Heunis, quoted in Financial Mail 18/5/1979). The state had to manage three different processes with the industry in the 1970s, all of which involved a cut in the industry's production (these will be more fully discussed below).

The first was the need to curb petrol consumption, via petrol restrictions; the second involved a general policy of encouraging fuel-switching by the state, particularly from fuel oil to coal, and the third was a process of policy change to accommodate the synthetic fuels industry in the early 1980s. The first two problems were dealt with by the oil industry by increasing the complexity of their refineries; most refinery expansion in the 1970s was aimed at lowing the fuel oil fraction, and increasing the petrol output per barrel (Financial Mail 3/5/1974, Financial Mail 27/6/1975, Financial Mail 16/12/1977), which simultaneously raised the petrol output per barrel and produced less (now superfluous) HFO. The state's approach to the problem of how to simultaneously persuade the oil majors not to disinvest, coerce them to fit their production to the requirements of the state's oil security strategy, and also maintain relatively stable and reasonable petrol prices and non-interruption of supply, was to compensate them through the regulatory system; as the state's chief liquid fuels industry bureaucrat in the 1980s commented:

> "I must admit that the local oil companies always served South Africa very well, and they did take into account the country's interests, because this is the one country, because of our regulatory system, where they still made profits.. ..no international company would withdraw

[26] Oil majors worldwide were keen investors in coal in the 1970s as a result of the switch back to coal in the wake of the energy crisis.

when they were making profits.. ..particularly when they were making losses in other countries" (Interview with S Van Den Berg).

The development of the regulatory system from the 1950s to the 1970s protected the oil majors in several major ways: import restrictions and licensing for refinery projects protected the refining industry from competition, and the Ratplan protected the retail trade from competition and managed the entry of new players, who were in any case dependent on the refiners for their products. For the oil majors, the regulatory system gradually increased refinery margins as the IBLC, based on 1950s assumptions about pricing and liquid fuels transport, rendered higher returns by comparison to refiners elsewhere. This compensated for the real decline in the marketing margin, which was irregularly increased, and subject to decline in real terms due to accelerated inflation from the 1970s on. Moreover, the industry was largely exempt from competition legislation from the 1930s onwards, and was only effectively brought under a competition law regime in the late 1990s (see below).

The oil industry liaised closely with government at a number of different levels, from Ministerial level downwards, and sat on a number of committees to regulate the retail and wholesale sectors, address bottlenecks and allocate portions of the retail market. The industry itself had developed a highly-structured co-operative system (given the exemption from competition legislation), which allocated different aspects of the relationship with government to different companies, co-operated on the maintenance of market share in most areas, and achieved various economies of scale through transfer arrangements (interviews with senior oil executives), to eliminate both unnecessary competition between majors, and any threat of adverse regulation. One of the oil majors was charged with responsibility for co-ordinating the industry's management of the regulatory process, and liaised regularly with a key group of government officials. Both the secrecy and the level of co-ordination within the industry were intensified by the state's oil security strategy, in which the oil majors participated in various key roles.

2) 1960s to 1980s

The outstanding feature of this period of policymaking was the development by the state of an oil security strategy, which was developed against a background of growing international pressure to impose a mandatory oil embargo on South Africa. While the early part of the strategy comprised a modification of the existing liquid fuels industrial and regulatory system, in the 1970s, the state embarked on a large-scale synthetic fuels programme, which significantly altered the nature of the South African liquid fuels industry in the long term. At the same time, the relationship between liquid fuels and coal engendered by the development of the synthetic fuels industry contributed significantly to the emergence of South African energy policy in the 1970s, as well as a series of

reforms integrating liquid fuels policy into new energy policy institutions. The existing regulatory regime was extended and modified to accommodate the synthetic fuels industry, while also preventing the withdrawal of the oil multinationals.

The origins and development of the oil embargo

The international environment just after the second world war was immensely favourable to South Africa. The Prime Minister at the time, Jan Smuts, had unprecedented international standing within the Allies, and particularly within the British imperial system. This changed with two simultaneous developments. The first was the victory of the pro-apartheid National Party in the 1948 elections, following which the new government (which held power until 1994) formalised and intensified racial segregation and exclusion developed during the colonial period into a theory of 'Grand Apartheid'. The second was the disintegration of the European empires in the wake of the second world war over a period of three decades, beginning with the independence of India in 1947, and ending with the decolonisation of the Portuguese imperial possessions in the mid 1970s. This fundamentally changed the nature of the international political environment, and led increasingly to South Africa's isolation on the world stage.

Pre-war international organisations such as the League of Nations were confined to Europe, the USA and a few small settler-dominated client states, whereas the United Nations, formed after the second world war, was comprised of a much broader and more representative set of nations, including two sources of pressure against apartheid. The first was Soviet bloc countries, which were opposed to apartheid on ideological grounds, had relationships with the South African Communist Party, were later key supporters of African (and South African) liberation movements, and who also saw South Africa as an integral part of the Western bloc. The second, and more politically significant, source of pressure comprised decolonised nations which had no historical ties with the South African state and no racial-colonial affinities with its governing white minority. Two groups were particularly significant: the first was India and Pakistan, which were admitted to the UN in the 1940s, and the second consisted of the newly-independent African states, which were admitted mainly during the period 1956 to 1964 (the majority from 1959-61). The first group were extremely vocal in the UN General Assembly, particularly on the treatment of the Indian minority in South Africa, and successfully proposed a number of resolutions in this regard (in 1946, 1950, 1952, 1957, 1959, 1961 and after), and both groups sponsored a constant stream of UN General Assembly resolutions from the 1950s onwards condemning apartheid. The first resolution specifically calling for sanctions was Resolution 1761/12 in 1962 (www.un.org 11/11/2004), which 'requested' nations to prevent exports to South Africa.

African states formed the Organisation for African Unity (OAU) in 1963, with one of their primary aims being to "..rid the continent of the remaining vestiges of colonization and apartheid" (www.african-union.org 12/11/2004). Asian and African countries forced South Africa's exit from the Commonwealth in 1960, and in the same year, a group of African countries proposed an oil embargo for the first time (Hengeveld & Rodenburg 1995b:18), which was formally adopted as an OAU resolution in 1964. Amongst more general appeals for sanctions and international pressure, a key 1964 resolution of the OAU Council of Ministers contained an appeal

> "..to all oil-producing countries to cease, as a matter of urgency, supply of oil and petroleum products to South Africa" (Resolution 31, 3rd session of the OAU Council of Ministers in Cairo 1964 www.african-union.org 12/11/2004).

However, the OAU resolution bound only African states, which were not major oil suppliers to South Africa, nor did their influence in the UN extend beyond sponsoring and voting for resolutions in the General Assembly; thus until the 1970s, the oil embargo remained an ambition of African and Asian states and anti-apartheid activists.

The OAU's opportunity came when the Arab states required their diplomatic support against Israel during the 1973 war, at which time African states traded condemnation of Israel for an inclusion of South Africa in the Arab states' embargo of Israel's allies. Given that 90% of South Africa's oil came from the Middle East, OAU Secretary General Nzo Ekangaki pointed out that

> "..the time has come for our Arab brothers to use the oil embargo as a weapon against the white regimes[27]" (de Quaasteniet & Aarts 1995:270).

When Arab countries lifted the embargo against other Israeli allies in 1974, the embargo against South Africa continued, and both the OAU and the Organisation of Arab Petroleum Exporting Countries (OAPEC) intensified international pressure to enforce it; in 1977 all OPEC countries except Iran undertook to support the embargo (de Quaasteniet & Aarts 1995:270), and in the wake of the Iranian revolution in 1978/79, the new Iranian government joined the boycott.

In 1975, a resolution was passed in the General Assembly for the first time specifically calling for an oil embargo against South Africa (Resolution 3411/30), an appeal which was repeated in 1976, 1979, 1980 and throughout the 1980s and early 1990s. The 1980 resolution (Resolution 35/206) spells out a comprehensive programme for an oil embargo, and repeats a call made in 1979 to the Security Council to pass a resolution imposing a mandatory embargo, which the Security Council had done in the case of the arms embargo against South Africa in 1977, in terms of Chapter 7 of the UN Charter. Resolution 36/8 of 1981 requested:

> "..the Security Council to consider, as a matter of urgency, the imposition of full mandatory sanctions under Chapter VII of the Charter of the United Nations against the racist regime of

[27] He included Rhodesia, then also under international pressure to dismantle a racist state, and in any case tied into South Africa's liquid fuels system.

South Africa, including, in particular, an embargo on the delivery of oil and oil products to South Africa."

The Security Council, despite repeated resolutions from the General Assembly, never did this, and so in terms of the UN, the embargo never escaped the status of a 'voluntary' embargo in the way that the arms embargo did (which was a 'mandatory' embargo), which made it more difficult to enforce. As the South African Financial Mail commented in 1979:

> "There are several ways of circumventing the ban on shipment to SA imposed by most oil-exporting countries. But a mandatory ban would put an end to such manoeuvres. It is not very likely that oil tankers would risk calling at SA ports if they knew that they would be identified by American or Russian spy satellites, and could face seizure when next calling at a port of any UN member state" (Financial Mail 29/6/1979).

The embargo was ended towards the end of 1993, as the General Assembly noted in Resolution 48/1 "that the transition to democracy has now been enshrined in the law of South Africa[28]..", and declared the oil embargo, as well as other sanctions, lifted.

The key points in the development of the embargo were the early 1960s resolutions, which led to the development of a major oil security strategy by the apartheid state, the 1973 imposition of an embargo by Arab producers, which caused South African companies to switch from Arab suppliers to an almost total dependence on Iran, and most significant, the 1979 Iranian decision to cut oil supplies, which provided a sudden shock to the South African oil industry. In 1972, 54% of oil imported into South Africa came from Iran, and the rest from Arab countries; in 1974, 90% was sourced from Iran, and 10% from Arab countries, and in the beginning of 1979, 91% was sourced from Iran (de Quaasteniet & Aarts 1995:271). Thus the 1979 development was dramatic, and led to a sharp intensification of strategic oil security measures by the apartheid state, including the assumption of oil procurement activities by the SFF. The embargo proved to be more permeable than the apartheid government anticipated; the Shipping Research Bureau, an Amsterdam-based group which monitored the oil embargo, published a list of 865 vessels which they thought had probably delivered oil or liquid fuels to South Africa between 1979 and 1993, 80% of which were VLCCs[29] (Hengeveld & Rodenburg 1995a:206-221).

By 1985, helped by a glut on the world oil market, the Department of Minerals and Energy announced in their Annual Report that

> "..the availability of crude oil for South Africa in the current world market situation and the fact that Sasol 2 and 3 are in full production made it possible for most of the fuel conservation measures still in existence to be lifted.." (Department of Mineral and Energy Affairs Annual Report 1985:58).

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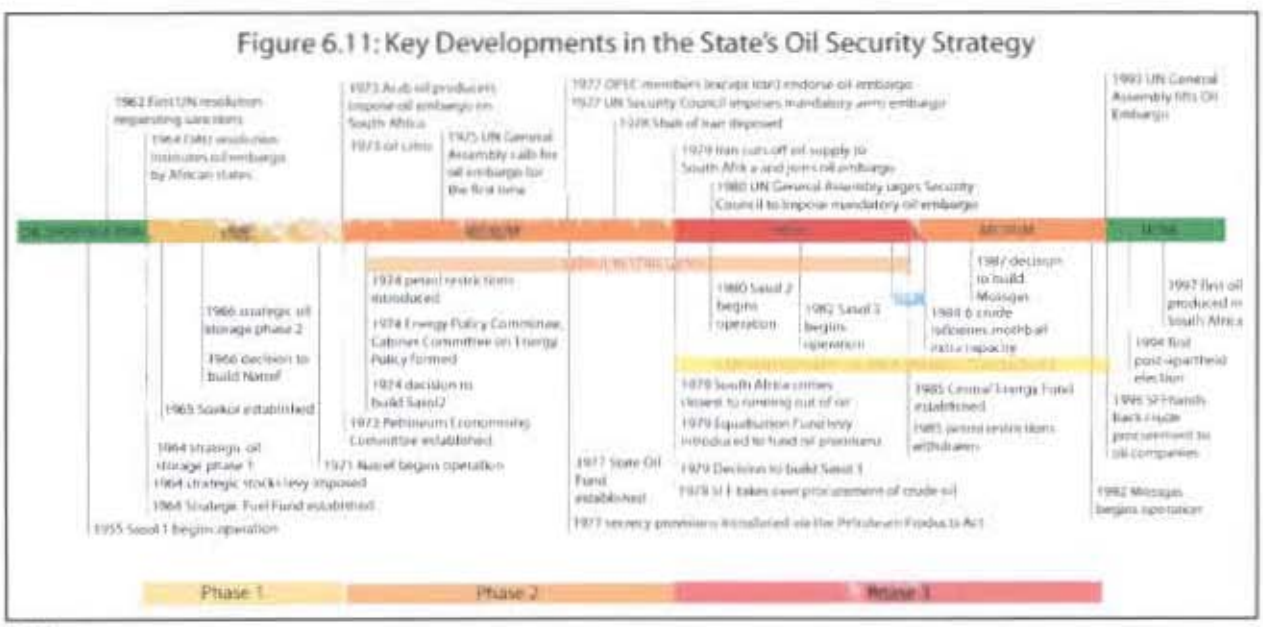
[28] The establishment of the Transitional Executive Council in 1993, to govern the country until the elections in April 1994.
[29] Very Large Crude Carriers, generally classified as crude oil-carrying supertankers of between 100 000 and 500 000 tons.

Premiums paid by South African state oil traders declined towards the end of the 1980s, as creative ways to circumvent the embargo were found and exploited (Van den Berg 1993, de Quaasteniet & Aarts 1995:272-9). Thus the period from the 1950s to the 1990s can be classified into periods of perceived risk for the apartheid state of not being able to import crude oil (see Figure 6.1 below): before 1964, there was a very low risk; from 1964-1973, there was a small but significant risk; from 1973 to 1979, there was a medium risk; from 1979 to 1985 there was a high risk; from 1985 to 1993 there was a medium risk, and from 1993 on there was no risk. This pattern of perceived risk determined key developments in the state's oil security strategy, as will be elaborated further below.

The State Oil Security Strategy

The key elements and developments in the state oil security strategy are portrayed in Figure 6.11 below. The development occurred in three phases, indicated above. The first phase, from the early 1960s to the 1973 oil crisis, consisted of the development of a large-scale strategic storage capacity coupled with a state-owned inland refinery, as well as the launching of an exploration programme, in an attempt to locate indigenous oil resources. The second phase, from 1973 to 1979, saw the intensification of the programme through the significant scaling-up of the synthetic fuels industry as well as a range of measures to cut liquid fuels consumption, including a programme encouraging industrial liquid fuels users to switch to coal or electricity, and a programme of petrol restrictions. The state also established an energy policy capacity during this phase, closely related to the oil security strategy, to develop a comprehensive strategic approach to the energy security problem. The third and most intense phase, which began with a real oil supply crisis, from 1979 to 1993, saw a doubling of the size of the synthetic fuels programme, the takeover by the state of crude oil acquisition, and the development of a long-term synthetic fuels policy; these were accomplished within a newly-established energy bureaucracy, in which most liquid fuels-related policy activity

Figure 6.11: Key Developments in the State's Oil Security Strategy



was centralised. From 1989, with the accession of De Klerk and a genuine reformist agenda, no further major developments took place, except for the completion of the Mossgas project. The phases will be examined in more detail below.

Phase 1 – 1960s to 1973

Early symptoms of the oil embargo led the state to initiate two programmes in 1964. The first was the launch of an exploration programme aimed at finding indigenous oil resources, and the second was the creation of a large-scale strategic oil reserve. The exploration programme was co-ordinated by a new state entity, Soekor, a state-owned limited company, whose function was to promote exploration by private firms, or if necessary undertake exploration itself. Soekor was overseen by the Department of Mines, since exploration and production permits were granted in terms of mining legislation, and had three roles: to promote exploration, to undertake exploration if necessary, and to regulate and co-ordinate the exploration process. Initially, prospecting activity was onshore; however no promising finds were made, and onshore exploration was finally abandoned in 1978 (Trollip 1996:4-13, Van den Berg 1993:51).

Soekor oversaw a licensing round of oil majors and others keen to explore offshore in 1968, and a programme of offshore exploration commenced, which declined in the early 1970s as international pressure and unpromising geology discouraged foreign companies from further exploration; the last internationally-financed well was drilled in 1976 (Van den Berg 1993:51). As a result, Soekor began an offshore programme itself in the same year, which continued until the mid-1990s, the main discoveries of the programme being a number of small oil fields off the southern Cape Coast (which are now in production), gas fields in the same area, and a gas field off the Namibian coast, which was not developed for political reasons (Trollip 1996:4-13). The gas field off the southern Cape coast was developed in the late 1980s as part of the Mossgas project, which will be further discussed below. The state, however, failed to achieve its primary objective, which was to improve oil security.

Soekor was integrated institutionally with the state's oil security strategy through its shareholders, which were in equal proportions Sasol and the IDC, until it was transferred to the Central Energy Fund in 1985, of which it became a subsidiary (Van den Berg 1993:51). Funding was in the form of grants from the state, channelled through the IDC, until 1985, after which it was financed from the CEF, in the form of grants until 1988, and in the form of loans thereafter (Van den Berg 1993:51). The total financial outlay of the state on Soekor's exploration programme is unclear, partly because of the way it was financed; however, the Auditor General reported that around R2.35 billion (total nominal amount) was paid to Soekor from inception to 1994 (Trollip 1996:4-13). Little data is available to corroborate this or to provide more insight on how it was structured; however,

distributing this amount according to available data (Department of Mineral and Energy Affairs Annual Reports 1980-1986) over the period in question renders a total amount of R9.75 billion in 2000 rands, some of which was in the form of loans.

The development of the strategic reserves occurred in two phases. The first was the establishment in 1964 of the Strategic Fuel Fund Association (hereafter SFF), a not-for-profit company owned by the IDC, the objectives of which were to:

> "..carry on the business of promoting, conducting, establishing, facilitating, guiding the State with regard to the location, procurement, storage, production and/or exploitation of fuels, materials, products and commodities which are or may become of strategic importance to the Republic of South Africa" (quoted in Van den Berg 1993:49).

Strategic oil storage facilities were developed in two phases. The first phase consisted of storage tanks built at the coast at Durban and Cape Town (Financial Mail 15/10/1966), which were relatively small compared to storage facilities built in the next phase, which commenced in 1966. The IDC and Sasol were requested by the government in the mid-1960s to assess the practicality of constructing a new Sasol plant in order to diminish oil import requirements; on account of the low price of crude oil, they were advised by Van Eck (who was also on the Sasol board at the time, as well as chairman of the IDC) instead to build an inland crude oil refinery linked to a strategic storage facility; in addition, the refinery should be developed with a partner which could if possible guarantee long-term oil supplies (Collings 2002:72, Davie 1995:249). This recommendation was accepted by government in 1966, which started work at around the same time on the conversion of a disused coal mine at Ogies into a strategic oil storage facility with a capacity of 118 million barrels (Financial Mail 13/1/1967, Trollip 1996:4-18), as well as a new crude oil pipeline from Durban to Sasolburg, the location of the new refinery, with a spur to Ogies. The pipeline, built from 1967-8, was built via Empangeni, near the coast north of Durban, in the hope of developing Richards' Bay as a deep-water port capable of receiving VLCCs, as well as locating the next refinery there (Financial Mail 11/8/1967). The strategic storage programme was veiled in (initially unsuccessful) secrecy, and oil imports for strategic stocks programmes were removed from official trade statistics (Financial Mail 26/5/1967).

The Natref refinery was the outcome of a complex set of negotiations between Sasol and the IDC, the Iranian National Oil Company, and the French oil major Total, which had entered the South African retail market in the 1950s. Both the French[30] and the Iranian involvement in Natref was tied to broader strategic goals: French participation was linked to weapons acquisition (Collings 2002:73), in particular Mirage fighter jets, which the apartheid government acquired in the early 1970s, and the deal with the Iranians involved an Iranian commitment to a long-term oil supply

[30] Total was at the time a subsidiary of a French state oil company.

contract for the refinery, as well as broader commitment to supply South Africa's oil needs and R52 million of the capital cost of the refinery, in exchange for a 17.5% stake (Financial Mail 7/6/1968). Iran also dispatched 400 workers to South Africa to help construct the refinery, who were classified as 'honorary whites'[31] by the South African authorities (de Quaasteniet & Aarts 1995:271). South Africa also entered into diplomatic relations with Iran in 1970 (Financial Mail 13/11/1970), and the Iranians invested in the South African uranium enrichment programme in the mid-1970s in exchange for supplies of South African (natural) uranium (de Quaasteniet & Aarts 1995:271).

Natref was unusual in various respects on account of its location inland, and its location near the coalfields, which meant that there was almost no nearby market for fuel oil; thus the refinery was configured to process a higher proportion of heavy fractions into 'white products' (a more 'complex' refinery), as well as to produce a large volume of jet fuel to supply South Africa's main international airport (Financial Mail 16/11/1979). It was also hailed as "..South Africa's most important industrial project for many years.." (Financial Mail 5/3/1971), and was the South African refinery with the largest nominal capacity at the time (57 bbl/sd) until Sapref was upgraded in the same year (from 44bbl/sd to 100 bbl/sd).

The development of Natref involved some regulatory innovations, and inaugurated a new relationship between oil companies, the state, and Sasol. The deal with the Iranians involved Sasol taking 70% of the product of the refinery (Financial Mail 5/3/1971), and Total the remaining 30%. Since Sasol did not undertake marketing of its own fuel (aside from the Blue Pump Agreement – see above), an agreement was brokered by government between the oil industry and Sasol called the Sasol Supply Agreement, whereby Sasol would not market its own products, in exchange for a commitment from the oil majors to buy Sasol's product in proportion to their market share, at IBLC prices. Government persuaded Sasol to enter into this arrangement (it had ambitions of entering the market at the time) on the basis that a) it would be cheaper for consumers, and b) that:

> "..it would be able to rely on government intervention that would compel the petroleum marketers to purchase the necessary Sasol production through their own distribution networks" (Van Den Berg 1993:41),

which it did a decade later. The way in which the IBLC was derived for Natref was that a transport element was added to the usual basic fuel cost at the coast, as if Natref's products had been imported to its refinery gate, thus giving it an extra margin[32], which in theory compensated it for the cost of piping crude oil from the coast (Van den Berg 1993:67). Another regulatory advantage

[31] This was the standard way in which the apartheid state approached the awkward problem of doing business with countries such as Iran, Taiwan and Japan whose citizens would normally have been classified in an 'inferior' racial group in terms of apartheid racial classification, which technically would have barred them from socialising with 'whites' (and attending official functions).

[32] Since this was an unregulated administered price which was set by a state agency, it could be used as an informal subsidy, and almost certainly was, since the marketing companies were obliged to buy all inland production at the price set by the mechanism.

which accrued to Natref[33] was the differential pipeline charges applied to liquid fuels products being piped from the coast to the inland market, and charges applicable to crude oil, which were much lower, and were based on an estimation of the 'white product' yield of a given quantity of crude oil for an average coastal refinery. Pipeline charges were then levied on the volume of potentially derived 'white products' (petrol, diesel, IP and jet fuel) from a load of crude oil; thus the heavier fractions were transported for free. This was referred to as the 'Natref Neutrality Principle', on the basis that Natref was disadvantaged by being inland (where it had been located for strategic reasons), and that this arrangement related the cost of transporting crude to the price which Natref added to its IBLC price for selling liquid fuels. However, the 1976 breakup for a barrel of oil rendered around 38% fuel oil, refinery fuel and losses (Financial Mail 24/9/1976), and the average for 1997 coastal refiners for this figure was around 30%, which would imply a discount by volume of 30-40%, whereas for Natref the actual yield of fuel oil was only 3-5% (Lloyd 2001:47), because of its plant configuration. Interviewees from the oil industry estimated that this difference yielded a 4-5c premium per litre in the 1980s and 90s (2-5% of the retail petrol price)[34].

There is some evidence (based only on interviews) that the decision to place the Caltex refinery in Cape Town was influenced by government's strategic considerations, given its proximity to Saldhana Bay, which could receive VLCCs and became the location of the second large-scale strategic storage facility. Although a refinery in the Cape area made sense in terms of the remoteness of the Cape market, the refinery has never run at full capacity due to the limited size of the market, which also pushed Mossgas' supply envelope east when it came on-stream in the early 1990s (Interview with Oil Industry executive).

The final strand of the 1960s oil security strategy was the acquisition by the IDC in the mid-60s of a tanker fleet, initially intended as an integral part of a state oil company (15/12/1966) to complement the strategic stocks and the new state refinery. The tankers were small to medium-scale, six in all, bought from the oil majors, and formed an integral part of what the Financial Mail called "..the grand design of the national oil plan" (Financial Mail 23/3/1967). The strategic role of the tankers was to transport crude oil from the Persian Gulf to South Africa; however, it probably occurred to state planners that the strategic role of a South African tanker fleet would be non-existent in a real embargo situation, since tankers could be easily identified in the Gulf. Another potentially more strategic role would be to move strategic stocks and liquid fuels between various coastal destinations. However, the key reason that the plan was sidelined was probably economies of scale,

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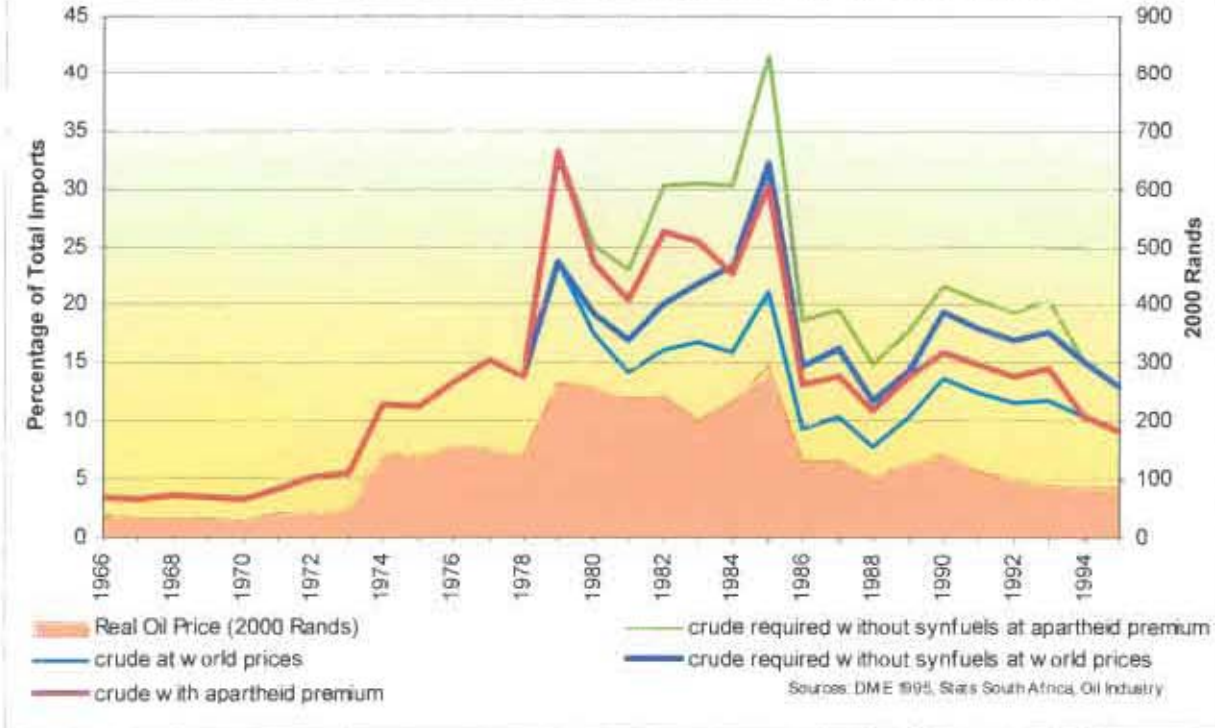
[33] This is not documented in the usual literature on regulation, but has been gleaned from interviews with oil industry executives; these views were confirmed in the hearings on the Pipelines Bill, which would establish a regulator for pipeline charges, when the oil industry divided into two groups terming themselves 'coastal refiners' and 'inland refiners' . Sasol hotly denied that Natref was 'subsidised' by this measure as alleged by the 'coastal refiners' group, but their rebuttal verifies the coastal refiner's allegations (see www.sasol.com).

[34] Lack of historical data on pipeline tariffs makes this difficult to verify.

Figure 6.12: Value of Crude Oil Imports as % of Total Imports



since medium-scale ships (less than 1000 00dwt) were ousted by VLCCs (100 000dwt and over) in the 1970s; the largest South African tanker was 70 000dwt. The tankers were placed in a subsidiary, Buren Beleggings, and ownership was divided between the IDC and Safmarine, the state merchant shipping company (Financial Mail 29/11/1969), and did not feature again in the state's oil security strategy.

Phase 2 – 1973 to 1979

The inauguration of phase 2 was triggered by the 1973 oil crisis, two outcomes of which were particularly significant for the government's oil security strategy. The first was the inauguration of the real oil embargo; for the first time, suppliers of a significant quantity of oil to South Africa had endorsed the oil embargo and stopped shipments. The second was the dramatic increase in the price of oil, which had two effects. The first, experienced by all oil-importing countries, and particularly by developing countries, was the massive impact that the price hike had on the trade balance. Figure 6.12 above portrays the value of oil imports[35] as a percentage of total imports for various scenarios. The real crude oil price in rands rose steeply after 1973 and after 1978 in tandem with world oil price increases. This was exacerbated after 1981, when the rand/US dollar exchange rate, relatively stable during the 1970s, began to increase precipitously as the rand depreciated, driving up the rand

[35] Due to the lack of data on crude oil imports, the data used in this graph has been derived as follows: crude oil imports until 1978 derived from Department of Mineral and Energy Affairs (1995) data on primary energy use, plus a 5% premium to account for exports, and after 1978 from oil industry figures for actual crude run in South African refineries. Crude oil which would be required to replace synthetic crude=actual 'syncrude' refined + estimate for fuel oil (around 25% by volume) fraction of natural crude. Premiums incurred in oil purchases are estimated based on P.W. Botha's R24 billion figure mentioned above, and distributed in a plausible fashion from 1979 to 1985, and declining premiums added until 1993 – these figures are thus largely speculative.

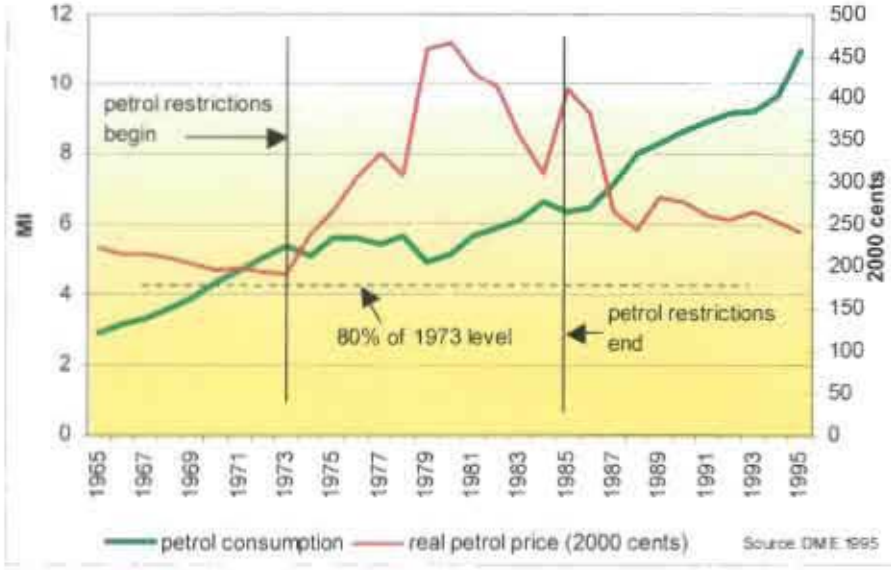
cost of oil in the early 1980s. Against this backdrop, the graph depicts South Africa's total crude oil bill as a fraction of total import value. The red line is an estimate of the actual cost of crude procurement, given the premiums paid by state oil traders in the 1980s, based on a fluctuating premium peaking at $20 in the early 1980s, but averaging around $12/barrel, which is higher than official state figures, but lower than that claimed by the Shipping Research Bureau (Hengeveld & Rodenburg 1995a:198-199), and lower than a figure derived from P.W. Botha's figure for the total cost. The estimates do not include possible acquisitions of strategic oil stocks, since it is assumed that these were acquired before this period[36]. The cyan lines indicate the impact on imports without a premium, and the dark blue and green lines illustrate the impact of not having built the Sasol plants. The key feature of the graph is that without Sasol, oil imports would have had a bigger impact on the balance of payments even at normal prices than actual crude acquisitions with an apartheid premium, which highlights the importance of the synthetic fuels industry as a macro-economic strategy.

The oil shock of 1973 doubled the impact of oil imports on the balance of payments, but a combination of starkly rising oil prices, the rand falling against the dollar, and the premium paid for crude on account of the oil embargo, caused a far more dramatic leap in oil's contribution to imports, which declined with the decline both in the oil price and the premium paid for crude. The existence of the Sasol projects made an impact of between 5% and 15% on total imports; thus, the project's status as an import-substitution strategy was also a major feature of the project for policymakers, who faced a significant trade deficit in the two years immediately after the first oil crisis. This was somewhat mitigated by a gold boom in the 1970s (triggered by the collapse of the Bretton Woods system in the early 1970s, and exacerbated by the effects of the oil crisis), which increased the output of gold mines significantly in the 1970s, and led to the sustained strength of the rand. The same was not true of the 1980s, which saw a significant decline in the value of the rand, and a real decline in gold production towards the end of the decade.

The second major impact was on prices and inflation. Since the economy was largely coal-based, the only sector which was seriously affected was the transport sector. The global impact of the oil crisis affected the South African economy in several contradictory ways. On the one hand, demand for exports dropped, but on the other hand, demand for gold and coal boomed, and the end of the 1970s saw the development of a massive coal export boom, as well as a massive electricity boom which was partly related to the gold boom. The direct impact on the real petrol price in the 1970s was driven both by real increases in the cost of crude oil (indirectly, through the IBLC), and also by

[36] This might not have been the case; the SRB implies that strategic stocks were bought in the early 1980s, which seems unlikely, but it is possible. This would have added considerably to the import bill, as would other expenses not included in this estimate such as losses from fraud (which were allegedly large).

Figure 6.13: Petrol Consumption and Real Price



the imposition of further levies to finance the synthetic fuels programme. The key factor, though, was the vulnerability which dependence on only one supplier, Iran, had brought. The three key responses of the apartheid state to the 1973 oil crisis were the imposition of petrol restrictions, the decision to build Sasol 2, and the development of a new institutional framework for energy policy making, of which liquid fuels was a central part. The state's reaction was almost blasé:

> "Thanks to a number of favourable considerations, South Africa was not caught completely unawares by the oil crisis and was able to cope, with slight adjustments and minor difficulties. The most important factor was undoubtedly the foresight of the authorities, which resulted in important steps being taken in good time to minimise the country's vulnerability. Consequently, it was possible to plan alternative strategies immediately, mainly because investigations.. ..had already reached an advanced stage. This information was of great value to the Petroleum Economising Committee which was set up by the Minister of Economic Affairs towards the end of 1973" (Department of Planning Annual Report 1974:7).

The 'steps' and 'investigations' mentioned above were the strategic storage programme and the special relationship with Iran, and more importantly, a series of studies, mainly by the Department of Commerce, but co-ordinated with the Department of Planning's nascent energy section, were undertaken into possible ways to curb petrol consumption, which formed the basis for measures recommended by the Petroleum Economising Committee, set up by the Prime Minister in late 1973 and advising him for the remainder of the 1970s. The measures which were put in place to curb petrol consumption consisted of restricted opening hours, speed limits, and other less enforceable measures such as encouraging use of buses and lift clubs. Government set a target of saving 20% of fuel consumption (from 1973 – Financial Mail 14/6/1975), but did not achieve anywhere near this level. Figure 6.13 above portrays the level of petrol demand and the real petrol price; although petrol demand growth did slow between 1973 and 1985, fluctuations seem to be better correlated with periods of high real petrol prices.

Part of the reason for high real prices during this period were added fuel levies to fund the synthetic fuels plants, as well as to cover the oil procurement premiums, which probably contributed significantly to a drop in consumption. After initial ad hoc measures, based on the web of informal agreement which comprised the regulatory system, parliament passed the Petroleum Products Act (120/1977), the purpose of which was to

> "..provide measures for the saving of petroleum products and an economy in the cost of the distribution thereof, and for the maintenance and control of a price thereof.." (Petroleum Products Act 120/1977:Aims).

The Act gave the Minister sweeping powers to set prices and prescribed a range of conditions for the selling of petroleum products, and for the uses of petroleum products, as well as providing for the Minister to issue regulations pertaining to any of these. The Act was used for a wide range of measures, including forbidding discounting of petrol in any form, forbidding credit sales of petrol, enforcing service standards, the banning of self-service, and applying various kinds of restrictions on fuel use. In addition to petrol restrictions, investigations were undertaken into a range of other measures to curb the use of non-petrol liquid fuels, including a campaign to encourage fuel oil consumers in industry to change to coal[37] (Financial Mail 3/5/1974) and electricity, the connection of small towns using liquid fuels to generate electricity to the newly-developed national grid, and investigations into reducing the use of illuminating paraffin (Interview with S Van Den Berg). The impact on fuel oil use was significant, and largely eliminated its use from the economy, but again this was probably largely driven by price[38], although assisted by coal policy initiatives in the mid-1970s, which sought to recapture markets lost to fuel oil in the 1960s. In the wake of the Petroleum Products Act, in 1978, the Departments of Commerce and Industry assembled a task team to draw up rationing scenarios for optimal use of the strategic stocks in the event of a total embargo, with two- and three-year time horizons (Interview with S Van Den Berg).

In the wake of the 1973 oil crisis, the Prime Minister ordered the establishment of both an Energy Policy Committee (EPC) and a Cabinet Committee on Energy Policy. The former was located in the Department of Planning, based on the small energy planning section that had been created in the early 1970s. The EPC consisted of representatives of key government energy assets (Sasol, Escom, the AEB), the Economic Advisor to the Prime Minister, the Secretaries of Commerce (also the Petroleum Controller/Price Controller), Industry, Mines, Planning, Foreign Affairs and also a representative from the Railways. Most of these representatives were involved directly in the

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[37] In 1974, the oil industry warned government of " 'grave consequences' if it continued to exhort industrialists to switch to coal" (Financial Mail 3/5/1974).

[38] In 1974, the price of HFO was around R60 per ton, whereas the wholesale price of coal (for industrial users) was R3.40 per ton. In energy terms, the price per GJ was R1.44 and R0.14 for HFO and coal respectively; in other words, a difference of a factor of 10. Fuel oil of course is far more convenient to use than coal.

development of the oil security strategy (Sasol, secretaries of Commerce, Industry, Mines (coal resources), planning, railways (transport logistics)).

The secretary of the EPC, and the head of the Secretariat in the Department of Planning, Dirk Kotzé, was a statistician with an oil industry background who pioneered energy planning in government, based on his experience in the oil industry. The EPC had two functions in the oil security strategy: it had a planning and co-ordinating function, and key decisions were referred to it concerning Sasol 2, Sasol 3, and other medium and long-term strategies for addressing key problems, including consideration of coal resources. The other function was to co-ordinate decision-making concerning medium- and long-term thinking about energy policy issues through the Prime Minister's Economic Advisor and the Cabinet. The EPC, however, was institutionally at some distance from the actual management of key measures of the strategy such as fuel saving and strategic stocks.

The key decision in the period from 1974 to 1979 was the decision to build Sasol 2, which committed the state to a synthetic fuels policy, which became fully-developed only in the early 1980s. IDC/Sasol consensus in the 1960s was that the oil price was too low ($1.80) to economically justify another Sasol, and expectation was that oil prices would remain at around the same level for the foreseeable future. By the early 1970s, increased oil prices had brought the possibility of a 'second Sasol' closer. By 1973 the average oil price was $3.29 (a 180% increase), and by 1974, it had risen to $11.58 (a 640% increase). At the same time, there was a key debate being waged in the country over coal resources, formally expressed in the Petrick Commission. Sasol's managerial elite, a key participant in the state's oil security strategy, began to frame the debate in terms of the kind of integrated resource perspective emerging with the Commission, and were critical of the 'cheap energy' coal-electricity nexus which dominated coal policy at the time. Dr P.E. Rousseau, founding MD of Sasol and chairman of the board, stated in 1970s that

> "..it is time that we approached our coal reserves, not from the restricted viewpoint of a series of small mines, but from a broad national point of view.." (quoted in Financial Mail 19/6/1970),

and suggested that coal prices (and thus electricity prices) be increased to fund higher extraction rates and longer reserve life. His successor as MD, David De Villiers, suggested 3 years later that electricity prices should be increased to pay for higher extraction rates: his main concern in advocating this was

> ".. to ensure the longest possible availability of coal as a chemical feedstock and base for liquid fuels" (Financial Mail 20/7/1973).

In the same interview, De Villiers discusses the possibility of another Sasol. The interview was conducted 3 months before the 1973 oil crisis; De Villiers commented that Sasol "..is constantly examining the economics of a new Sasol", a plant which would need to have a minimum capacity

of 2740 Ml of petrol per year to be economical, and probably would not be a possibility until 1977 (Financial Mail 20/7/1973). Four months after the interview was published, in November 1973, Arab oil producers added South Africa to a list of embargoed countries (de Quaasteniet & Aarts 1995:270).

Actual details of the decision-making process leading up the Sasol decision are confused and contradictory (e.g. Collings 2002:65, Lang 1995:182). From interviews and media reports, the following account seems to be the most coherent. Sasol's relationship with government was conducted through the Department of Industries and the IDC. Discussions and negotiations concerning the likelihood of a new Sasol plant had begun in the 1960s, been broken off after the Natref decision, and taken up again as the oil crisis unfolded. Sasol's main concerns were a) the oil price, which was too low, and b) economies of scale: government had to commit to building a large-scale plant, at least 5 to 7 times larger than Sasol 1, in order to be economically and strategically worthwhile. The massive oil price hike in late 1973 solved the oil price problem, and increased the urgency of addressing the question of the plant. Preliminary studies were done by Sasol and the IDC in the early months of 1974. The Prime Minister established the EPC and the corresponding Cabinet Committee in April 1974. David Kotzé, head of the EPC's secretariat in the 1970s, outlined the actual decision-making process for both Sasol 2 and Sasol 3, which involved setting up a sub-committee of the EPC:

> "The way it was done was to form a committee of all the responsible authorities; IDC, department of commerce, dept of industries, and so on and so forth; department of planning.. [the decision was made] ..within weeks. I was a member of that committee. They got together all the responsible people, and they just decided that we need to build a second Sasol at Secunda.. ..when there was a second threat [1979], they just decided to double up the plant, a third Sasol adjacent to the other plant; but every time it was within weeks" (Interview with D Kotzé).

The sub-committee was headed by the Secretary of the Treasury, G.W.G. Browne, and formed of a subset of the recently-formed EPC (which did not begin to function until September) including representatives of Sasol, the IDC and the Departments of Commerce and Industry (Interview with D Kotzé). Cabinet minutes from 3 December 1974, state that:

> "Cabinet decided in principal that a second Sasol should be built, as planned by Sasol and recommended by the Browne Committee, and that the financing of the project will be as specified in the memorandum, which will involve a levy of 2 cents per litre on the relevant fuels" (Cabinet Minutes 1974)[39].

[39] Original in Afrikaans – own translation.

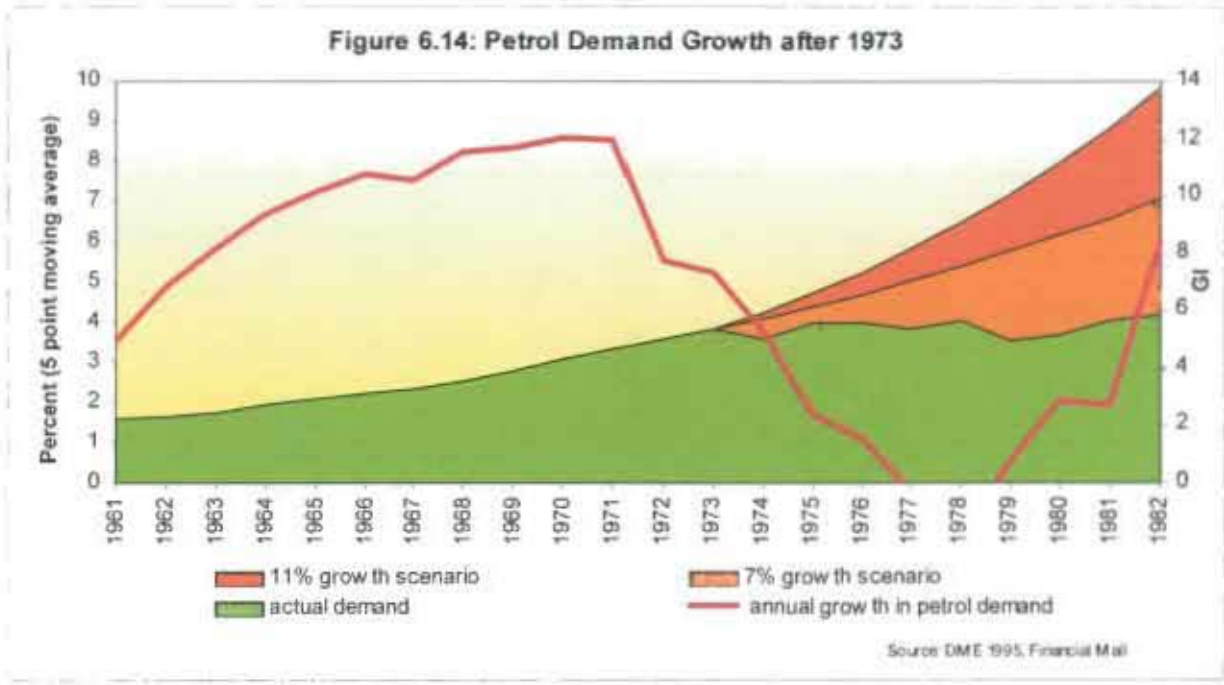
The planned plant was smaller than the 'economic' size suggested by De Villiers; 1975 predictions were that Sasol 2 would produce 1200Mt/a of petrol (1622 Ml), significantly below the 2740 Ml predicted by De Villiers. There were several institutional and policy contexts to this decision. The role of the IDC, as well as of key economic policy advisors, framed the Sasol decision in two decisive contexts. The first was the context of industrial strategy, in which it was consistent with other IDC energy-intensive mega-projects of the time, and given the nature of the Sasol projects as petrochemical and synthetic fuels industries, would provide significant linkages between different areas of the Minerals Energy Complex, promoting a massive flow of investment into the industrial economy with significant spin-offs such as boosting coal and electricity demand. Fine and Rustomjee described the Sasol 2 and 3 decisions as "..the most decisive industrial policy since the formation of Iscor [in the 1930s]" (Fine & Rustomjee 1996:169).

The second key context was the importance of cutting imports in the 1970s. Repeated Economic Development Plans in the 1970s cited the importance of cutting imports and boosting exports, particularly oil. The economic and strategic importance of a positive trade balance was highlighted in 1972 by the Reynders Commission (Commission of Inquiry into the Export Trade), and the key import-substitution projects of the 1970s were identified by the 1978 Economic Development Programme as Sasol and Armscor; the Report argued that no further import substitution was necessary:

> "..the big strategic import replacement projects (viz crude oil and arms), will contribute greatly towards keeping the growth of imports within limits" (South Africa 1979a:29).

The third policy context alluded to above, resulting from the developing integration in the proto-energy policies of the time, was coal policy, which was linked with an energy-intensive optimum resource use paradigm emphasising an integrated approach to use of the national coal resource. The Sasol project did not intend to *save* energy or coal; it was by contrast highly energy-intensive. Part of this process energy was derived directly from burning some of the feedstock, and part of it was in the form of electrical energy. Sasol 2 and 3 together require 900 MW of generating capacity, of which 500 MW is self-generated; Eskom's nearby Kriel power plant was built specifically to supply the Sasol plants (Fine & Rustomjee 1996:80).

The outstanding issue regarding Sasol 2 was the relationship between the oil refiners and Sasol. The latter would have to absorb Sasol's output, which would entail considerable disruption to the refineries' own expansion planning processes. Before the oil shock, the refining industry had assumed a 10% rate in liquid fuels consumption growth per annum, which was scaled back to 7% after 1973 (Financial Mail 18/7/1975), and planned their refinery expansion accordingly. Commentators in the mid-1970s deduced that government planning processes assumed an 11% growth in liquid fuels consumption when planning Sasol (assuming that at the time, the government



would not require refineries to mothball capacity). These assumptions, plus a 5-point weighted average growth rate for petrol, are portrayed in Figure 6.14 above.

Growth in petrol demand grew rapidly during the 1960s, reaching an average peak of above 8%, which declined in the early 1970s and became negative in the late 1970s (not shown). As a result, typical post-oil-crisis planning errors followed, with even the modest 7% growth rate used by the refiners after 1973 proving overoptimistic. Another problematic factor was the oil industry's decision to invest in complex refinery equipment to boost light fraction output and cut fuel oil production; nevertheless, in the mid-1970s, the general view was that accommodating Sasol 2 production in the South African market could be managed. This was not possible after 1979, given shrinking demand and the additional production of Sasol 3, and special arrangements had to be made (see below).

The financing of Sasol 2, managed through the IDC, was funded through export credits (25%), parliamentary grants (15%) and a levy on liquid fuels (60%). The levy payments (additional to the existing strategic fuel fund payment) were initially included in the tax component and administered by the IDC, but in 1977 the state created a separate funding vehicle, the State Oil Fund, which was created specifically to fund synthetic fuels projects. The Fund was created through the State Oil Fund Act (38/1977), which authorised the state to impose levies on liquid fuels, for financing or promoting any activity related to the production and marketing of synthetic fuels , and "any other object for which that Fund may be applied, and which has been designated or approved by the said Minister in consultation with the Minister of Finance" (State Oil Fund Act 38/1977:Clause 2), which was effectively a 'self-financing' provision for the synthetic fuels industry, analogous to Escom's Capital Development Fund: in 1977, 16% of the petrol or diesel price was levied for

financing Sasol 2, and in the same year, 22% of the electricity price financed Eskom's expansion. It is not clear what later proportions of liquid fuels prices were allocated to funding Sasol 3, but these quantities probably increased significantly (in absolute terms) in the early 1980s, given the short lead time of Sasol 3 and the inflated costs of the project.

Phase 3 – 1979-1993

South Africa's relationship with Iran came to an abrupt end with the fall of the Shah at the end of January 1979; the decisive moment in the oil embargo was the 4th of March, 1979, on which day the new Iranian government which had taken over after the fall of the Shah broke all relations with South Africa and joined the oil embargo (de Quaasteniet & Aarts 1995:272). In reality, the supply of oil from Iran had been disrupted from December 1978, as strikes in the Iranian oilfields disrupted production. South Africa's peculiar dependence on Iranian oil (in 1978, 96% of South Africa's oil came from Iran) meant that, unlike other countries caught in the supply crisis of 1978/9, South Africa could not switch to other producers, raising the spectre of a real shortage, and at the least a short-term crisis. A number of short-, medium- and long-term measures were taken in response. Short-term measures included an intensification of fuel-saving measures, the centralisation of crude procurement and its transfer to the state, the imposition of a seamless blanket of secrecy on every aspect of the industry (to frustrate pro-embargo activists), and the decision to expand Sasol's capacity by the construction of another plant identical to Sasol 2. Medium-term arrangements included altered regulatory arrangements with the oil majors to accommodate the new synthetic fuels in the production and regulatory system and the reorganisation of the state's energy agencies into one Department, and long-term measures included adopting a policy of an expanding synthetic fuels programme which would provide a minimum threshold of South Africa's liquid fuels on an ongoing basis, as well as a related research and development programme into alternative fuels.

Crude Procurement

The first emergency measure was drawn up between the SFF, oil majors and the Departments of Commerce and Industry, and transferred oil procurement from individual refineries to the state, in the form of the SFF. In late 1978, the Minister of Economic Affairs asked oil majors who sourced their oil from Iran to draw up contingency plans, and also announced a new fund, the 'Acquisition Equalisation Fund', consisting of the proceeds of an additional fuel levy, to fund premiums incurred as a result of procuring oil outside the orthodox oil market (Financial Mail 22/12/1978), thus preserving the economic rationality of the regulatory system (which was based on world prices), as well as removing the political responsibility for breaking the embargo from individual oil companies. There is some evidence from interviews that oil companies would not have been able to source crude themselves, due to lack of support from their international parent companies, which

were under considerable pressure from anti-apartheid activists to disinvest. The procurement strategy also gave the state a key role in managing the crude oil supply situation, as well as developing extremely close co-operative relationships with the oil industry.

The State Oil Fund Act was amended (30/1979) to establish the Equalisation Fund, which could be used for purchasing crude oil or petroleum products, financing any premium on crude oil purchases, or for

> "..manufacture of or research in connection with petroleum products, as determined by the Minister of Economic Affairs in consultation with the Minister of Finance.." (State Oil Fund Amendment Act 30/1979:Clause 1A-4).

The SFF, with a little experience in trading crude oil through the acquisition of strategic stocks, took over the acquisition of most of the country's crude requirements, with the exception of Total and Shell, who procured their own crude oil through their international parent companies (Interview with S Van Den Berg). The SFF was managed by Sasol on behalf of the state, and taken over by the IDC in the early 1980s, with the privatisation of Sasol 2 (and thus the majority of Sasol).

The state oil procurement process, which lasted from 1979 until 1993, occurred in two phases. The first phase, from 1979 to 1985, was characterised by a steep learning curve and a difficult world market with real shortages of supply. Complex deals were done, often a cargo at a time, commanding high premiums and often involving a significant degree of subterfuge, and the SFF was the victim of fraud on a number of occasions. Unusual barter deals were concluded clandestinely with countries such as Iran, involving South African-made weapons[40] (de Quaasteniet & Aarts 1995:273). In phase 2, from around 1985 on, world oil prices fell, and there was a glut on the world market. The SFF developed routines for circumventing the oil embargo through intermediaries (such as oil traders John Deuss and Mark Rich); the source country was informed, through the dealer:

> "It was the policy, as far as possible, particularly in the last couple of years, that if you buy crude oil from country x, you work through a third party, but the government of that country must know that it comes to South Africa, that was always the prerequisite; so all the governments involved did know about that" (Interview with S Van Den Berg).

In this way, South Africa was successful in sourcing adequate supplies of oil at a declining premium towards the end of the 1980s, mostly from the Middle East (de Quaasteniet & Aarts 1995:279). Crude was sold by the state to South African refiners at 'international market prices' (Van den Berg 1993:58); the difference between the actual purchase and the derived market price was absorbed by the state from the Equalisation Fund.

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[40] There is a well-documented by not clearly proven instance of South African involvement in the 1980s in the Iran-Contra scandal, whereby weapons from the US were shipped via South Africa to Iran through a series of stages, one of which probably involved oil destined for South Africa.

Secrecy Provisions

A key plank in the South African strategy was secrecy, which not only frustrated attempts by embargo enforcers to track oil supplies to South Africa, and make strategic assessments of the domestic oil supply, but also protected traders and suppliers, as well as oil companies active in South Africa. The key mechanism for this was a 1979 amendment to the Petroleum Products Act (72/1979), which imposed a blanket of secrecy on almost all aspects of the liquid fuels industry. The key provision stated that:

> "(1) No person shall publish in any newspaper, periodical, book or pamphlet or by radio, television or any other means:
>
> (a) information in relation to:
>
> (i) the source, manufacture, transportation, destination, storage, quantity or stock level of any petroleum products acquired or manufactured or being acquired or manufactured for or in the Republic;
>
> (ii) the taking place and particulars of negotiations in respect of the acquisition of petroleum products for the Republic and the transportation thereof; or
>
> (b) any statement, comment or rumour calculated directly or indirectly to convey such information or anything purporting to be such information [..]
>
> (2) Any person who contravenes the provisions of subsection (1), and the proprietor, printer, publisher or editor of any newspaper, periodical, book or pamphlet, or the broadcaster of any radio or television programme, in which any information referred to in subsection (1) has been published in contravention of subsection (1), shall be guilty of an offence.
>
> (3) Any person who causes to be published outside the Republic anything of which the publication is prohibited by subsection (1), shall be guilty of an offence.
>
> (4) Any act prohibited in subsection (1) which is committed outside the Republic by any South African citizen or any person domiciled in the Republic, shall be deemed to have been committed also in the Republic.
>
> (5) Any offence contemplated in subsection (4) shall for the purposes of jurisdiction be deemed to have been committed in any place in the Republic where the accused happens to be.
>
> (6) For the purposes of this section 'petroleum product' includes crude oil." (Petroleum Products Amendment Act 72/1979 Clause 4A).

Thus the Act covered all aspects of the industry, and technically even covered reflecting aloud on topics such as the source of South Africa's crude oil, or the circulation of rumours relating to the oil industry. Penalties applied not only to individuals but also to the media involved, and applied to anyone anywhere in the world, who in theory could be extradited to stand trial (or certainly tried on entry to South Africa) for publishing such information elsewhere in the world. Penalties included huge fines and jail terms of several years.

The application of secrecy laws to the liquid fuels industry had a dramatic institutional effect. What had previously been a highly secretive industry became hermetic in the extreme. Oil companies separated their crude acquisition departments physically from the rest of their businesses; working in crude acquisition required security clearance from the Special Branch[41]; the same conditions applied to civil servants (Interviews with Oil Executives, DME officials). Knowledge of how much crude oil the country was using, or other related information about quantities of liquid fuels produced each year, were restricted to a handful of people within the oil industry and government. This had immediate repercussions not only for anyone wishing to inquire into the government's liquid fuels policies, but for government department and for oil companies as well. Government energy planners (and definitely any others) were routinely denied information on the industry. Information on production was only accessible to a handful of people, and often not even to oil companies' own planning divisions (Interviews with oil executives)[42]. Both energy planning and analysis, as well as effective governance, were rendered difficult or impossible, and deliberation on policy issues took place only at a very senior level, which enhanced the silo-like nature of energy policy processes in the DMEA, and furthered the institutional divide between planning and regulatory functions. Secrecy provisions were instrumental in crippling the most ambitious energy policy project of the apartheid government, the National Energy Council, whose deliberations were also classified. Public debate on liquid fuels policy became impossible, until 1993, when most secrecy legislation was repealed.

Sasol 3, Restructuring and Privatisation

The second immediate response was the decision to build Sasol 3, which involved simply building a replica of Sasol 2 on the same site, which would draw on the same coal resource. Sasol was asked by government to evaluate the possibility of doubling coal production at Secunda in December 1978, to which they replied in the affirmative (Sasol 1990:36). The procedure was the same for the Sasol 2 decision (a swift evaluation by a subcommittee of the EPC); however the context was different. From 1978, the government had considered the possibility of a total embargo; government planners had drawn up contingency rationing plans in 1978, and the Sasol 3 decision was heavily influenced by short-term emergency considerations. It was clear from around the beginning of 1979 that the Shah's government would not regain power, and it did not, finally disintegrating at the end of January 1979. The Sasol 3 decision was taken by a subcommittee of the EPC within a few weeks,

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[41] A branch of the apartheid state's police which dealt specifically with 'political' offences and related issues, which had a notorious reputation (entirely well-founded) amongst anti-apartheid activists for harassment, torture and murder.

[42] An example of the comprehensiveness of these prohibitions and the zeal with which they were implemented is an attempt by the Energy and Development Research Centre at UCT to publish a study on paraffin in low-income households in 1993. The study contained estimates of how much paraffin households used, and thus required Cabinet permission. A request was funnelled up to Cabinet via the Department of Mineral and Energy Affairs and was turned down on the grounds that knowledge of the paraffin market would be an indicator of paraffin production, and thus of crude consumption.

and it was announced on 22 February 1979 (Financial Mail 23/2/1979). The plant would cost R3.276 billion (R34 billion in 2000 rands), which would be raised by a combination of the partial privatisation of Sasol, parliamentary grants and levies on liquid fuels through the SOF. Funding from the initial privatisation was around R700 million, and the rest was provided through the SOF, some of which included parliamentary grants; however most of the plant was financed from liquid fuels levies, which were converted into 'loans' under the privatisation agreement.

The privatisation of Sasol was conceived as a way of funding Sasol 3, as well as the funding of future synthetic fuels projects; it originated in the late 1970s in Sasol, and was converted into a long-term policy by the mid-1980s. Sasol 2 had taken 6 years to build; Sasol 3, on the other hand, took only 18 months, and was producing liquid fuels by the end of 1982. The scale of the combined Secunda operation is massive, including a massive coal-mining operation, synthetic fuels plants, refineries and other petrochemicals processing plants, and is one of the largest single industrial projects in the world[43].

The proposal for privatisation, allegedly the brainchild of Joe Stegmann, the MD of Sasol in 1979, was approved in principle by government in 1979 (Sasol 1990:36). The process involved the formation of a holding company, Sasol Ltd (henceforth Sasol), and the separation of the three plants into separate companies, Sasol 1, 2 and 3. Then, in a complicated transaction, Sasol paid R400 million and a 30% stake in Sasol to the IDC, in exchange for which it received 100% of Sasol 1, and 50% of Sasol 2 and Sasol 3. The rest of the shares in Sasol were offered to the public, and the share issue was massively oversubscribed, since in terms of the conditions contained in the prospectus, it was a low-risk, high-return investment. The business world were ecstatic, and the financial press hailed the privatisation as both a victory of South African resolve in the face of international pressure, and as proof that P.W. Botha was following through with his promises of reducing the role of the state in the economy:

> "Sasol is the ultimate South African V sign to the world sanctions threat, with the added advantage that it will be profitable too. Furthermore it is the first major public corporation in which Government has carried out its promise to reduce its involvement in the economy." (Financial Mail 16/11/1989).

The remaining stake in Sasol 2 was bought from the IDC by Sasol in 1983 for R2.6 billion (R1.1 billion in cash, R778 million in share issue, and R1.4 billion converted into a loan to Sasol, repayable over 5 years at 1.5% above interest on Escom bonds). The remaining stake in Sasol 3 was sold to Sasol in 1990 for R2.9 billion (R617 million in cash, conversion of remainder into a loan at 16%, repayable as follows: R133 million cash, 4 annual instalments of R400 million, final

[43] The Secunda plant is also thought by South African energy analysts to be the largest single point source of CO_2 in the universe.

instalment of R550 million, and the interest rate linked to a $23 floor price for crude oil[44]) (Van den Berg 1993:36-39, Sasol 1990:36-37).

The 1979 prospectus for the initial share offer assured investors that the state would guarantee two things: the first is that Sasol would earn a reasonable rate of return, and that if it did not, the state would provide the necessary 'tariff protection', and that

> "..the industry must have the assurance that as international oil prices increase in the future, the prices of its products will also increase" (quoted in Arthur Andersen 1995:33-34),

which thus removed the risk from the investment, as well as linking the price of Sasol's products to crude oil, thus removing the options of applying a rate-of-return form of regulation to the synthetic fuels industry or imposing windfall taxes during prolonged periods of high oil prices. Several developments followed from Sasol's privatisation. The first was that Sasol's management role of the SFF and the various funds was discontinued in the early 1980s, and transferred to the IDC, and then to CEF. The second was that energy policy fora such as the EPC were 'broadened' to include private sector participants, which initially only extended to Sasol, thereby preserving Sasol's membership of the energy policy 'inner circle'. The third involved the development of a synthetic fuels policy framework in the mid-1980s which was based on two aspects of the Sasol experiment: 1) new projects would be initiated by the state with funds from previous privatisations, and then privatised, and 2) the same regulatory conditions would apply, which provided a model for the successful transfer of risk from investors to liquid fuels consumers.

Institutional Innovations: the DMEA and the CEF

The major institutional innovation of the period was the formation of the Department of Mineral and Energy Affairs as a result of P.W. Botha's civil service reorganisation of 1980; energy was identified as a key strategic policy area. Disparate policy functions relating to the energy sector were collected and placed in a new section of the Department of Mines, on account of the coal nexus, focused specifically on the connection between coal and synthetic fuels production (Interview with S Van Den Berg), which was the central plank in the state's oil security strategy. The new Energy Branch was headed by Dirk Neethling, founder and former head of the Minerals Bureau, and included all the liquid fuels functions from the Department of Commerce and the Department of Industry; the other key component was the EPC secretariat, which transferred from the Department of Planning. There was an operational division between regulatory functions, which were carried out by the former Department of Commerce and Industry personnel, and planning functions, which were carried out in a separate branch of the DMEA by the ex-Department of Planning personnel. The former were restructured into a 'management and administration' branch

[44] The link basically specified that if the world crude price was below $23 (which triggered a subsidy from the state to Sasol), then the interest rate would be reduced.

when the National Energy Council was formed in 1987, and the latter into a planning subsection called 'transport energy', which in reality concentrated almost exclusively on the supply side.

The privatisation of Sasol, the shift in policy on synthetic fuels programmes, and the ambitions of the Energy Branch to escape the orthodox bureaucratic model led to a restructuring of the state's strategic assets in the liquid fuels sector in 1984/5. Sasol's privatisation resulted in its withdrawal from key functions in the oil security strategy in 1984 (Department of Mineral and Energy Affairs Annual Report 1984:63); previously, it had managed the SFF (and its procurement programme) on behalf of the state, as well as the State Oil Fund and the Equalisation Fund, and had thus overseen a large part of the state's oil security strategy; its privatisation thus signalled a significant institutional shift. These functions were taken over by the IDC until 1985, when these funds and operations, together with Soekor, were collected under a holding company; initially SOF Pty(Ltd), which was renamed CEF Pty (Ltd), with the renaming of the SOF as the Central Energy Fund in 1985. The State Oil Fund Amendment Act (46/1985) renamed the SOF the CEF and the Act was retrospectively retitled the Central Energy Fund Act.

The Act grouped the three key Funds, the Central Energy Fund (previously the State Oil Fund), the Equalisation Fund and SFF, under CEF (Pty) Ltd (from now on CEF[45]). Levies were set by proclamation instead of legislatively (as they had been), and CEF, although institutionally a private company, would be accountable to Parliament. A mechanism for the state to purchase 'shares' was also laid out, allowing transfers from the fiscus to the CEF funds. The Board would be appointed by the relevant Minister. The CEF board was in fact comprised of two representatives from the IDC (one of whom was the chairman), the head of the Competition Board, a representative of the Reserve Bank, the head of the DMEA's Energy Branch and the Director-General of the DMEA, and representatives from Mobil (an oil major) and Gencor (which was contemplating investment in a synthetic fuels project, and did invest in Mossgas). The SFF Board consisted only of the two IDC and two DMEA representatives (Department of Mineral and Energy Affairs Annual Report 1985:64).

The actual operation of CEF was outsourced to the SFF's management, since the SFF had a staff, whereas CEF was merely a holding company. The personnel of the SFF, appointed during the Sasol era, and primarily originating in Sasol, effectively ran CEF, since the organisations shared chairpersons (Interview with H Roberts), until CEF's restructuring in the late 1990s. CEF's other function was to administer the IBLC, since the SFF had access to international oil market information. There were thus several key functions which CEF performed. The first was, via the SFF, crude oil procurement and strategic stocks maintenance. Oil trades, after some of the

[45] The distinction between the holding company and the Fund are somewhat confusing – from now on, CEF will denoted the holding company, and the Central Energy Fund will denote the Fund.

disastrous incidents of the early 1980s[46], were subject to a process of ministerial approval (Interview with S Van Den Berg). The second function of CEF was to partially fund the National Energy Council during its existence from 1987 to 1991, which was done via levies on petroleum products and coal, the aim of which was to give the NEC a certain degree of independence outside the orthodox bureaucracy. The third function was the administration of the three funds, which were used for a variety of purposes, including buffering liquid fuels price increases, paying subsidies to synthetic fuels producers and compensation to refiners (see below), and, more importantly, funding further synthetic fuels projects (see below). The function of CEF in this regard was to fund new projects in partnership with the private sector and then withdraw (through loan redemption or privatisation), using the resulting funds to fund the next project, thus playing a key financing role in what at the time was perceived as an ongoing synthetic fuels industry development process on a large scale.

The Synthetic Fuels Programme and Other Alternatives

After the emergency responses to the crisis of 1979, the apartheid state was keen to commit itself to a long-term programme of oil independence. The dire existing situation, both in terms of the oil embargo and a declining rand and high oil price, strengthened commitment to an expanded synthetic fuels programme. Far from being seen as the 'white elephant' that Sasol had been labelled by the anti-apartheid movement, Sasol was regarded inside the country (at least by the white business and political elite) as a prestige project. The press hailed Sasol 3 as the latest in a series of megaprojects comprising an "energy jamboree" (Financial Mail 29/6/1979); at the end of 1979, Sasol was hailed as

> "..the ultimate South African V sign to the world sanctions threat, with the added advantage that it will be profitable too" (Financial Mail 16/11/1979).

From 1980, the holy grail of liquid fuels self-sufficiency was converted from the ad-hoc reaction which it had been to the 1970s oil crises to a programme with well-defined parameters, based on economic and strategic tradeoffs. Initial policy measures were based on two principles. The first was a decision to involve a wide range of private players, which involved shifting the locus of the state strategy from the Sasol/IDC/Department of Industries nexus, which had underlain the development of the 1970s and 1980s strategies, to a cluster of private mining houses associated with the 1970s coal boom. The second was a programme of incentives announced in 1980 by the

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[46] The most notorious of these was the *Salem* affair, which involved an insurance fraud, whereby a cargo of oil belonging to Shell was sold illegally to the unwitting SFF. The operators of the vessel then scuttled it off Senegal. Shell claimed insurance for the oil from Lloyds, who detected the fraud and refused to pay, whereupon Shell discovered the actual location of their oil, and the apartheid state was forced to pay Shell $31 million in compensation (Scholtz 1995:258); the willingness of SFF to pay premiums attracted other dubious middlemen to South Africa in the early 1980s. Transactions involving some of these involved overpayment (even over and above premiums paid by the South Africans) of around $200 million, and led to an investigation by the Auditor-General in the mid-80s (Scholtz 1995:263)

government for new synthetic fuels projects, which included an extension of "tariff protection" applied to Sasol to all new projects, and a non-discriminatory tax regime for alcohols[47] and other non-petrol/diesel fuels, as well as extra incentives for diesel-producing projects, to balance the overproduction of petrol by the Sasol plants (Department of Mineral and Energy Affairs Annual Report 1980:74).

Two processes took place thereafter. The first involved a number of proposals from various sources for potential projects, which included various kinds of plant-based as well as minerals-based fuels. These were considered by a Synthetic Fuels Working Group, a subcommittee of the EPC, which would consider these proposals, as well as define an energy policy which

> "..would encourage potential manufacturers to produce sufficient indigenous liquid fuels to meet South Africa's desired level of self-sufficiency at minimum involvement (and cost) to the state, and minimum risk." (Department of Mineral and Energy Affairs Annual Report 1982:63).

By 1983 it was apparent that the incentives would not be sufficient to make projects viable, and that the state would have to involve itself in the financing of projects as well; by 1985, three potential projects were being considered: a gas-to-liquids project proposed by Soekor on the basis of the gas field off Mossel Bay; a torbanite distillation project proposed by Gencor, and one involving a coal-based synthetic fuels project proposed by the private explosives and chemicals firm AECI (Trollip 1996:29).

The other process undertaken by the DME was a planning and projection process, involving the construction of demand forecasts, with the aim of deriving a 'desirable level' of 'self-sufficiency' in liquid fuels production, undertaken by the DMEA's energy planning division headed by Dr Robert Scott, who stated in 1982 that in the DMEA's model for coal resource optimisation,

> "..it was assumed that all domestic liquid fuels needs would be coal-based as from the year 2000" (quoted in Financial Mail 5/3/1982).

Scott was quoted in another article as specifying the self-sufficiency requirement at 70%, which would require three more Sasol 3 plants by 1995, and another one every three years after (Financial Mail 5/3/1982). However, the Department's scenario planning process arrived at a figure of 40% as strategically sufficient (Interviews with DMEA officials), influenced by the permeability of the oil embargo and the failure of repeated attempts by the UN General Assembly in their requests to the Security Council to institute a mandatory embargo. In order to maintain this figure, which had been exceeded by Sasol from 1983, it was necessary to investigate a new synthetic fuels project which would start up by the end of the 1980s, to counter growth in demand which was slowly lowering the percentage of synthetic fuels.

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[47] The proposal was to apply taxes by energy content rather than by volume: since alcohols have a lower energy content than petrol/diesel, if taxed by volume these would be taxed more per energy unit (thus more expensive in terms of useful energy/cent), thus rendering them less appealing in the market.

By 1985, the government had committed itself to the gas project. The other projects continued to be 'evaluated' after this, but were not considered practical options for economic reasons. Other contributing factors to the choice were the location of the project in P.W. Botha's constituency, and the role of Soeker, who were the key advocates of the project; the project was the first and only potentially productive result from Soekor's exploration programme, and the project thus had a high political significance for the agency. The announcement was hailed by the DMEA as the beginning of

> "..a whole new era in South Africa's energy and industrial development.. [and] ..of special significance regarding the energy self-sufficiency of the RSA and consequently its economic and strategic defensibility" (Department of Mineral and Energy Affairs Annual Report 1985:67).

Feasibility studies were carried out until 1987 by Soeker, at which time the now-named Mossgas project was given the final go-ahead. The project did not conform to the synthetic fuels industry model outlined by the synthetic fuels policy, in that there was not a significant private partner (Gencor, and later Engen took an option in the project, but never took it up), and CEF's role was far more extensive than anticipated. Not only did CEF finance the project, but it also managed the project closely. When Cabinet finally approved the project, mainly[48] to be financed from the Central Energy Fund, R6.2 billion was budgeted; the final cost was between R11 billion and R12 billion (Trollip 1996:4-29), which resulted in a plant of only 40 000bbl/day crude equivalent capacity finally coming on stream in 1992. The reasons for the cost overruns were various. The most significant included a switch from Mobil to Sasol technology when Mobil disinvested, which involved a complex licensing process[49], restrictions imposed by Sasol on the construction process (which made it difficult to manage), the insistence at ministerial level on not using the experienced contractors Fluor[50] (which had constructed the Sasol plants, and thus were experienced in synthetic fuels plants construction), and a serious mistake in assessing the gas reserves. The latter was a result of the project being based on P50[51] reserve figures for planning the project, rather than the conventional use of P90 figures, which meant that the project had a much shorter lifespan, and it was necessary for the post-apartheid government to expend another R2 billion in developing another gas field in the late 1990s (Interview with Senior CEF executive). The economics of the

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[48] 25% of the capital for the project was borrowed overseas in dollars, and repaid from operating profits. In practical terms, with cost escalation, R9 billion was sourced from the Central Energy Fund, in the form of 'quasi-equity' or 'shareholders loans without repayment terms' (Interview with Senior CEF executive), which was effectively written off.

[49] The licensing conditions also placed severe restrictions on Mossgas's ability to produce or market petrochemicals, which is one of the key advantages of synthetic fuels manufacture, thus prejudicing the plant's economic options severely.

[50] The reason for this was that apparently the Minister was afraid that Fluor might be forced by US sanctions legislation to withdraw from the project, since Mobil had just disinvested due to domestic pressure in the US. Instead, a consulting firm that had overseen some of the nuclear projects (under the same minister) was contracted, but lacked experience and capacity.

[51] 'P50' and 'P90' reserve calculations refer to the likelihood of a particular estimation of a gas or oilfield being correct. Thus a P50 reserve estimate of x implies that there is a 50% chance that there is x gas in the field; for quite logical reasons, it is very unusual for projects to proceed on the basis of P50 estimates.

Mossgas project were thus disastrous; in the late 1990s, the book value of the plant was written down to around R2 billion, and the plant has been dependent on subsidies of two kinds since its inception, which will be dealt with in more detail below. No other synthetic fuels plants have been contemplated.

Another key policy issue, which also contributed to cost overruns on the Mossgas project, was the problem of the underproduction of diesel (see introduction) by the synthetic fuels plants. While Mossgas was designed to produce more diesel, a number of policies were pursued in the late 1970s and early 1980s to reduce diesel consumption[52]. The key strategic demand for diesel was from the military, and the curtailment of the war in Angola and the withdrawal from Namibia, coupled with the public transport shift to petrol-driven minibus taxis which occurred in the late 1980s, led to a petrol-intensive economy and a diesel surplus, which is now exported. A final area of activity which formed an active if ineffectual part of the oil security strategy was a research programme into alternative fuels, first run by the CSIR's National Programme for Energy Research, and then, with the merging of the NPER into the National Energy Council in 1987, through the NEC. None of the research in the programme was operationalised.

Regulation and Accommodation: the Oil Majors, Compensation and Petrol Price Mechanisms

This phase of the oil security strategy created a number of regulatory dilemmas. The basic dilemma for the state was how to advance the synthetic fuels industry while accommodating the crude refining industry, which also controlled the downstream part of the industry. This was necessary not to encourage investment, which was not required in the 1980s, but to counter the pressure being exerted on oil majors to disinvest from South Africa by anti-apartheid campaigners in Europe and the USA, since the oil majors still played a vital role in the liquid fuels market in South Africa, and thus were a key ingredient of the oil security strategy. The oil majors, on the other hand, needed to demonstrate that their presence in South Africa was sufficiently profitable to their international owners to justify their resistance to international pressure to withdraw.

The key intersection of the strategic and economic interests of both the state and the oil majors was the regulatory structure, and in particular the determination of liquid fuels prices. The basis for the state's pricing policy was stated in the 1985 Draft Energy Policy White Paper as

> "..the maintenance of a price structure that takes into account economic, efficiency-related, social and strategic considerations, as well as reasonable returns at the production and distribution levels.." (Draft Energy Policy White Paper 1985:21).

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[52] These were chiefly pricing diesel at the same level as petrol (most countries impose less tax on diesel), and a regulation forbidding transport of goods further than a certain distance by road without a licence, which was not an energy policy measure, but an older form of protectionism for the railway system, and which was abolished in the late 1980s. In addition, the emergence of the minibus taxi industry was chiefly a result of an apartheid-inspired neglect of public transport, which, if it had been more rationally planned, would probably have used diesel buses instead.

The key points at which this list of often-contradictory criteria was put to the test was during a renegotiation of liquid fuels pricing structures with the oil industry in 1983/4, another round of negotiations in 1991, and a less significant set of negotiations concerning the purchase of Mossgas' production from 1992 onwards.

The key focus of the 1983/4 negotiations was the wholesale margin, which had been fixed in the early 1960s, and adjusted very little since then, which meant that in real terms it had declined by around 80% due to inflation, which was minimal before 1970 but very significant afterwards. The decline in the wholesale margin was compensated for by the surplus inherent in the IBLC, as well as improvements in efficiency and total volume (Van den Berg 1993:28). However, the commissioning of Sasol 2 and 3 would require the oil majors to market Sasol's entire output, which would be purchased at the IBLC plus transport premium; thus the majors would not be able to make up lost returns in marketing through refinery profits, since Sasol would be manufacturing over half the liquid fuels in the country. Since the synthetic fuels plants had to be run at full capacity to be economical[53], if the oil majors refused to 'uplift' Sasol's entire production, Sasol (and the state's synthetic fuels programme, now wooing private investors) would suffer a serious setback, including a legal obligation to compensate shareholders. The result was a complex trade-off, involving several interrelated components.

The first component was the extension of the Sasol Supply Agreement, an unsigned agreement originally concluded to accommodate the output from Natref in the oil major's marketing activities. The industry had been optimistic about accommodating the synthetic fuels industry's production in the mid-1970s (Financial Mail 18/7/1975). Investment in extra refinery equipment in the wake of the oil crisis to increase the output of 'white products' per barrel rendered this more difficult, but low and negative growth rates in demand in the late 1970s, combined with the development of Sasol 3, made it impossible without cutting production at the crude refineries. Since government was loth to cut production at Natref for strategic and economic reasons[54], the coastal refiners agreed to mothball some of their refining capacity. A new extended Supply Agreement was concluded between government and the oil majors, the Crude Refiners' Agreement, in terms of which the crude refiners agreed to buy all Sasol's output "in recognition of the strategic nature" of the synthetic fuels projects, and in exchange were paid annual compensation for mothballing refining capacity.

Mothballing was extensive: in 1983, Calref and Enref mothballed 62 000 and 22 000 barrels/day of refining capacity respectively, and in 1985 Sapref mothballed 59 000 barrels/day of refining

[53] With a subsidy.

[54] Natref is a more complex refinery; thus the economic consequences of lowering throughput would be more serious. In addition, cutting Natref's production would probably have complicated Sasol's privatisation process; but the simplest reason is probably that Natref's production, indirectly subsidised by the transport differential, added to Sasol's overall profits and removed some of the pressure for subsidies.

capacity; in total, 37% of the oil majors' refining capacity. The Department of Mineral and Energy Affairs acceded to requests from refineries to export liquid fuels, which had been severely restricted in 1979[55]. The aim of the compensation payment was to compensate refiners on lost refining margins due to reduced throughput, and these were calculated accordingly; from 1984 to 1993, R1.26 billion compensation was paid (nominal – Van den Berg 1993:41). Payments were stopped when the new government took over in 1994.

The compensation payments were part of a broader deal involving a new price mechanism for determining wholesale margins, the Petroleum Activities Return (PAR), which replaced the old system of opaque margin-setting with a process based on assessing the refining *and* marketing assets of the oil majors, including refining assets. Then a margin was calculated, using an assessment of the depreciated assets of both refining and marketing assets, and a margin set which would provide the oil companies with around 15% return on assets (Van den Berg 1993:28) for marketing and refining activities. Thus, the IBLC was only relevant between 1984 and the demise of PAR, in 1991, as a basis for calculating the price at which Sasol's production was 'uplifted' by the oil majors. The aim of including the refining assets was to lower the total margin received by the oil companies (Van den Berg 1993:28), since the return on assets for the refineries was on average most likely to have been lower than the IBLC. As in later asset assessments in the liquid fuels industry in South Africa, the process for assessing the asset base was not thorough nor critical, and the method permitted the oil majors to make significant profits during the 1980s[56]. The combination of compensation and acceptable gross margins was sufficient to achieve government's goal of preventing the oil majors from disinvesting. Only one company, Mobil, disinvested, as a result of legal pressure from the USA. The others did not, for a variety of reasons, but the key reason, according to interviewees, was profitability. One senior executive recalled that there was only one year when the South African subsidiary's profit level was the same as the group's global profit levels; for the rest, South African profits were far higher:

> "South Africa was a very profitable association; [the South African subsidiary] used to send back 100 million dollars every year from 1980.. ..we used to get regularly, at least every second year, someone coming to do the divestment from South Africa, especially when [the global company] was going through bad times.. ..and every year, they'd go back, and find that they just couldn't justify it financially" (Interview with Senior Oil Executive).

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[55] Under the Import and Export Control Act, both import and export of liquid fuels had been controlled before 1979, but in practice imports were more severely restricted, since South African refineries supplied much of southern Africa. In the wake of the 1979 oil crisis, export controls had been significantly stepped up until the supply crisis was over.

[56] Although there is no hard information on this, and will probably not be in the future, interviewees who worked in the oil industry in the 1980s indicated that both the refining and the marketing asset bases contained significant assets which were not 'used or useful', such as mothballed equipment or non-fuel marketing assets such as convenience stores, which would explain the industry's alleged profits in the face of state attempts to limit returns. The validity of these claims will only be tested if the PAR audits are ever released into the public domain.

At the same time, the pricing regime provided a protected environment for the synthetic fuels industry (including Natref), which was protected both by the IBLC mechanism (which provided an indirect subsidy though both the fiction of transport differentials and through the inherent premiums built into the formula), as well as through direct subsidies, which, although disguised as 'tariff protection' (via a rebate on the Equalisation Fund), amounted to a transfer payment. Subsidies were initially set at an absolute level per litre of liquid fuels, but were later altered in 1989 to a 'floor price' mechanism (described above), whereby subsidies would be paid when an artificial crude price, derived from the IBLC, dropped below a 'floor price' of $23/barrel, to make up the difference. In other words, Sasol was guaranteed a minimum product price which matched what the IBLC would be if the crude price was $23. This minimum product price was dollar-linked; thus, since almost all of Sasol's synthetic fuels production costs were in rands rather than in dollars, the minimum price rose in rands as the rand/dollar exchange rate declined, as it did steadily from the mid-1980s. In addition, there was a guaranteed market for all Sasol's products; these two measures in combination effectively removed risk from the enterprise. The other key principle applied to Sasol's product prices was that Sasol would get the benefit of any liquid fuels price increases above the 'floor price', although in theory a certain percentage of 'excess profits' would be paid back to the state until the total subsidy payments had been redeemed. There is no evidence suggesting that this was ever done.

Within this context, the framework for the price structure was settled for the duration of the 1980s. The actual prices of liquid fuels were however still set in a non-transparent way, which meant that mechanisms to calculate price elements formed the basis for price-setting, but the actual price was set at a political level (usually approved by Cabinet), taking into account strategic and other considerations. The price elements also determined how income from liquid fuels sales was distributed, and served as a basis for making future adjustments where certain parties had 'underrecovered' their dues. This malleability, as well as the inherent flexibility in the key levies administered by the DMEA, gave the Department considerable leeway in setting prices, the aim of which was to achieve an element of price stability (in the face of fluctuating oil prices and a declining rand), and as low a petrol price as possible. This price manipulation involved a range of measures: in 1981, the Equalisation Fund was used to defer price increases; in 1982, the oil industry temporarily absorbed increases[57]; in 1983, increases were deferred by 'restructuring' the crude procurement programme and temporarily reducing the SOF levy; in 1984, increases were absorbed by the Equalisation Fund; in 1985, the Equalisation Fund was totally depleted, and increases were absorbed by the sales of a portion of the strategic stocks to offset a massive price hike due to the rapid depreciation of the rand against the dollar.

[57] When this happened, the total 'absorption' was paid back to the industry through deferred decreases or later additional increases.

The next key point was a renegotiation of the regulatory system in 1990/91, which 'deregulated' refining margins, and set up another mechanism, the Marketing Petroleum Activities Return (MPAR), which calculated a gross wholesale margin based on the collective marketing assets of all companies involved in petrol and diesel marketing; the margin was set to allow a return of 15% on marketing assets. The oil industry's motivation for proposing the changes was based mainly on a strategic assessment of the advantages in terms of increased refinery returns which would accrue from a return to IBLC pricing, which was based on three flaws in the IBLC which had developed since the formula was derived in the 1950s. The first and second were the use of posted prices and small shipping vessels in calculating product prices and freight rates respectively (these have been discussed above), and the third was the so-called 'sweet/sour' price differential on the world market between crude oil with a high sulphur content ('sour' – which is cheaper) and a low sulphur content ('sweet' – which is more expensive). Since South African environmental regulations lagged behind other markets for which products from the 'marker' refineries for the IBLC were destined, the IBLC was based on a more expensive feedstock (and potentially a more expensive refining process), which meant that an added premium could be earned from IBLC pricing by betting that South Africa would take significantly longer to 'catch up' environmentally, and processing cheaper 'sour' crudes[58].

Additional motivations were depreciation of the refinery asset base, which meant declining margins, and the added advantages which would accrue from a separate rate of return for marketing only (Interviews with Oil Industry Executives). The atmosphere at the time was set by the disinvestment of Mobil in the late 1980s, which raised the spectre of the other four international companies ceasing operations in South Africa, which disposed government to be more accommodating to the oil industry. The incentive that the industry offered government was significant investment programmes in the coastal refineries, which was effectively a commitment not to disinvest. An investigation into the regulatory system (which was partly funded by the oil industry), demonstrated that the industry would earn similar returns under the proposed system, but that the proposed system would allow

> "..the oil industry to make a free-market decision on whether to proceed with the refinery expansions they envisaged at that stage.." (Van den Berg 1993:29).

Thus, the Cabinet decided that "profit monitoring of the oil industry be restricted to marketing only" (National Energy Council Annual Report 1992:38). The same Cabinet decision also rejected deregulation of the whole value chain (the subject of another report) on the grounds that regulation

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[58] In fact, much of the diesel produced at South African crude refineries in the 1990s and early 2000s has higher sulphur content than even the lax South African standards, and was blended with Sasol's diesel, which has almost no sulphur due to the need to remove it before the synthesising process, to prevent poisoning of catalysts (see Lloyd 2001). New lower sulphur standards, as well as a long-awaited ban on lead in petrol, will come into effect in January 2006.

was a key part of the state's oil security strategy; and devolved decisions on product price changes from the Cabinet to the DMEA , in cases where price fluctuations were solely the result of fluctuations in the IBLC.

The pricing structure for Mossgas was negotiated in the early 1990s on a 'transitional' basis, and negotiations continued sporadically until 2000. Mossgas was disadvantaged by comparison to Sasol by its location at the coast, which meant that the refinery gate price applicable to its products did not include a hypothetical transport cost inland, as the IBLCs for Sasol and Natref did. In addition, the oil industry and the DMEA agreed that Mossgas' product would be purchased by them "..on a commercially neutral basis"(Van den Berg 1993:47), or as SAPIA put it, SAPIA members have purchased Mossgas' production "..since the plant came on stream in late 1992 though there was no statutory obligation or commercial gain for them to do so..' (South African Petroleum Industry Association Annual Report 1997). In fact, the 'transitional' arrangement[59] was based on an export-parity or 'Africa Netback'[60] price (Department of Minerals and Energy Annual Report 1998:16), which was considerably lower than the IBLC (ironically, an import-parity price), since the export price was based on an international market rate (closer to a real import parity) at which the refining industry in South Africa exported liquid fuels to other southern and east African countries.

The rationale for this approach to pricing was that the oil industry would have to export an equivalent amount of liquid fuels to create space in the market for Mossgas' production; thus a 'commercially neutral' arrangement would involve paying an export price for it. The Cabinet resolved in 1993 that Mossgas should receive the IBLC price for its products (as well as the same subsidy applicable to Sasol) (Department of Minerals and Energy Annual Report 1998:16), but not from oil companies, and from then on two payments were made to Mossgas from the Central Energy Fund. The first was a synthetic fuels subsidy (on the same terms as Sasol), and the second was a 'synlevy' payment, which was reported in the early 1990s as a 'mothballing' payment to the oil industry by the DME (up to 1996), but a 'synlevy' payment to Mossgas thereafter. The result was the same, since the difference was transferred to the oil industry. The pricing arrangement was so clearly not a 'commercially neutral' one that the Auditor General launched an investigation into it in 1997, because

> "..the Office of the Auditor-General wished to establish whether these payments, which amount to very large sums of money, were reasonable, in particular from the perspective of the taxpayer and the motorist" (Auditor General 1997:1).

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[59] The 'arrangement' was in the form of an initial transitional agreement lasting one year. Due to fundamental disagreements between the parties, another agreement could not be reached, and the interim arrangement persisted until 1998, which was one of the factors which perturbed the Auditor General.

[60] In the early 1990s, based on a Mediterranean spot price plus $2.20/ton, which was about $2 lower than the IBLC (Lloyd 2001:25)

The Report found that several advantages did accrue to industry from the 'interim arrangement'. Among these was the fact that the arrangement was in reality not conditional on the industry not using refinery capacity (since this was not verified in any way), and that in fact some of Mossgas' product categories (for instance 97 octane petrol) were being *imported* by industry, which meant that the oil industry was earning a roughly $2/ton margin on Mossgas' products by selling them in the local market at IBLC. In addition, the location of Mossgas was an advantage to the oil companies due to its proximity to regional markets, because fuels were priced as if they originated in Cape Town (in terms of the zoning system), but only had to be transported from Mossel Bay. Mossgas diesel, which contained almost no sulphur, could also be blended with crude-derived diesel to improve its specifications (Lloyd 2001:25, Auditor General 1997:3). The Report, having found that the oil companies were net importers of petrol, stated that the Auditor General's Office could not confirm that the payments were reasonable; as a direct outcome, a new pricing agreement was reached at the beginning of 1998, whereby the oil industry agreed to buy Mossgas' products at the IBLC price (Department of Minerals and Energy Annual Report 1998:16).

3) 1993-2004

Liquid fuels policy activities in the 1990s were dominated by a complex and uncertain process of untangling the security-dominated liquid fuels complex of the apartheid era. These activities moved through several phases. In the first phase, from 1993 to 1995, policy deliberation passed from the DMEA into the transitional negotiating process, where a multi-stakeholder Liquid Fuels Industry Task Force was initially formed to deal with a national outcry over a fuel price rise, but was swiftly given a mandate to deal with broader policy issues in the liquid fuels sector. The second phase, from 1995 to 1998, focused on the Green and White Paper processes which developed a post-apartheid liquid fuels policy framework. The third phase, from 1998 onwards, represented the 'normalisation' of the policy process, as policymaking moved back into the DME, in which a post-apartheid leadership had been appointed, and the White Paper framework was considerably modified; the outcome was that the core of the apartheid-era regulatory system was formalised and preserved, and deregulation, espoused as the main policy goal in the White Paper, was deferred indefinitely.

1991 to 1998: Transitional Policy Processes

In the latter half of 1991, broad-based support by the white business establishment for the oil security strategy, and the synthetic fuels industry in particular, began to disappear. The Mossgas fiasco had discredited the state's synthetic fuels development programme, and this disapprobation was extended to Sasol, which had in the late 1970s and early 1980s been regarded by the same

media first as a demonstration of South Africa's technological prowess, and then as a triumph of private enterprise. By late 1991, the business press was claiming that "..Sasol is not the private sector success story that it claims to be" (The Executive (editorial), November 1991:7); but on the contrary, a massive drain on national resources (through subsidies), and the subject of a detailed review article in late 1991 (The Executive November 1991:13). The article contained a detailed analysis of the liquid fuels industry and the regulatory system (which would have been illegal under secrecy legislation and probably still was at the time it was published), which alleged (correctly) amongst other things, that a) Sasol was the recipient of massive subsidies from liquid fuels consumers (that year, over R1 billion), and that b) the regulatory system advantaged all industry players, but was specifically designed to advantage Sasol. The article made so many unprecedented allegations that Sasol attempted to rebut them in full-page advertisements in daily newspapers in all major centres, alleging that the article was specifically designed to "discredit Sasol not only with its customers and investors but also with the public at large" (Sasol Advertisement, Cape Times 29/11/1991). However, the damage was done, and the media followed it up with a series of reports and editorials on the synthetic fuels industry, which were unanimous in their conclusions that a) although financial support for Sasol, and other strategic measures, were necessary during the oil embargo, these should now be dismantled, b) the regulatory system which supports these should also be removed (for instance, Financial Mail 15/11/1991, 10/4/1992, 8/10/1993).

This pressure was exacerbated in 1993 by the removal of secrecy provisions and a Competition Board investigation into the liquid fuels industry, which was commissioned in March 1993 and reported at the beginning of 1994, which found that the South African industry was fundamentally anti-competitive, that competition had significantly reduced prices to consumers after deregulation in other markets, and recommended that price control and the Ratplan should be phased out (Competition Board 1994:3). Before the investigation concluded, a report compiled by the DMEA for the Cabinet, in response to the clamour for deregulation (Department of Mineral and Energy Affairs 1993), found that a) no parts of the regulatory system could be removed separately (policymakers thus had a choice between the current system and full deregulation), and b) removal of any element of the regulatory system was undesirable:

> "Any change to the current proven system must, particularly in a developing South Africa, deliver a guaranteed better overall deal for the country. Evidence internationally suggests that such a guarantee would not be possible to deliver" (Department of Mineral and Energy Affairs 1993:33).

The Cabinet concluded at the beginning of July 1993 that there would be no deregulation of the liquid fuels industry (Department of Mineral and Energy Affairs Annual Report 1993:65).

The government had thus met what was a growing policy crisis with a blunt demurral. The policy crisis however suddenly turned into a political crisis in September 1993 as protests against a 7c/l petrol price rise spilled out into the streets. The protest was launched by minibus taxi[61] associations against the last in a series of petrol price increases; taxi associations were able to cause significant disruption by blockading public roads. The protest spread to trade unions, who joined the protest as consumers, partly out of frustration at the (general political) negotiation process underway (Crompton 1998:4). The protest was aimed both at the immediate increase and also at the unilateral and non-transparent way in which the petrol price was set, which, like almost all aspects of the apartheid state's policies, was now open to question.

The protest caused an immediate political crisis for the apartheid state, both in the context of the ongoing transitional negotiations, and because government was finalising an agreement on GATT between government, business and labour. The Minister of Minerals and Energy set up a Liquid Fuels Industry Task Force (LFITF) within the National Economic Forum[62] two days after the crisis erupted (Crompton 1998:2). The LFITF had been constituted in terms of the structure of the NEF, comprising government[63], represented by the DMEA and the CEF (including Mossgas), business, represented by the South African Chamber of Business (SACOB – traditionally representing 'English' business interests) and the Afrikaner Handelsinstituut (AHI – traditionally representing 'Afrikaans' business interests), and labour, mainly represented by COSATU-affiliated unions involved in the liquid fuels or transport industry. The liquid fuels industry was represented through SACOB (the oil majors) and the AHI (Sasol). When more fundamental policy considerations began, the taskforce was broadened, and the Automobile Association, the Motor Industries Federation, Transnet, the organised taxi industry, the South African Agricultural Union, and several other agricultural and transport interests were also included (Crompton 1998:9). The ANC was excluded on the grounds that the NEF framework did not include political parties, which left the unions as the only participant aligned with the ANC; however, key union personnel such as Crompton were also prominent members of the ANC's energy policy forum, the Minerals and Energy Group.

Two processes began in the LFITF: the first was aimed at defusing the immediate crisis, and then extended by the Minister to the problem of proposing a more politically sustainable pricing system (Crompton 1998:5), and the second was concerned with the more challenging task of negotiating a new regulatory framework. The first process got underway immediately: the LFITF's initial

[61] Minibus taxis were a privately-owned (largely black-owned) form of public transport, and provided commuter services, primarily for poor and black commuters.

[62] The National Economic Forum (NEF), established in 1992, was a negotiating forum to facilitate policy discussion between business, labour and government in the context of the transition from apartheid. It was replaced by the National Economic Development and Labour Council (NEDLAC) in 1995, which is a permanent statutory body designed to facilitate consultation between labour, government, business and community organisations on major policy issues. Government has a statutory obligation in terms of the NEDLAC Act (1994) to pass major social, economic or labour policy or legislation changes through a consultation process in NEDLAC before proceeding with them.

[63] The apartheid government until April 1994.

mandate was to find ways of partially reversing the September price increase to defuse the resultant political crisis. Thus, the key challenge of the LFITF in the short term was to allocate the costs of a petrol price decrease amongst industry participants. Their initial proposal to the NEF in October, that government sell off a portion of the strategic stocks to subsidise the price temporarily (the costs being borne only by the state) was rejected by Cabinet (Crompton 1998:5). A further proposal was made, splitting the costs of the decrease between Sasol and the oil majors[64], which reduced the price by 2c/l; this was accepted by government; thus, the immediate crisis was resolved.

In order to prevent further revolts over petrol price increases, the government transferred the price-setting function to the LFITF, which performed it from November 1993 to April 1994, overseeing several price reductions due to fortuitous international oil price movements. A rise in the price of crude oil in June 1994, which would have resulted in a significant price increase, prompted the LFITF to achieve a more permanent solution, which consisted of two elements. First, the IBLC would be re-evaluated, since it was widely (and correctly) suspected that it gave unnecessary benefits to liquid fuels producers, and second, the process of price-setting would be removed from governmental discretion, and thus de-politicised, by developing a transparent formula which would derive the petrol price automatically from the IBLC on a regular basis. The Task Force was also eager to relinquish its price-setting role (Crompton 1998:11). Key reforms to the IBLC were the replacement of the 'marker' refineries, which had been refineries owned by the oil majors in South Africa, with other 'neutral' refineries; the replacement of the shipping component with rates for more realistically-sized tankers; and a change from pure posted prices to a mix of 80% posted prices and 20% spot prices[65]. These measures were immediately successful in lessening the price increase, and collectively had a long-term effect on the petrol price. The price would also henceforth be adjusted automatically once a month in terms of the new IBLC. The changes were approved by Cabinet and implemented in late 1994.

The second, and more difficult, process began with the enlargement of the LFITF in the wake of its first success. The process unfolded on two levels: on the first level, a process got underway to achieve a degree of consensus on a post-apartheid policy framework, which was primarily an ideological struggle (between proponents and opponents of deregulation), and on the second level, the forum became a battleground between Sasol (and Mossgas as a supporting act) and the rest of the oil industry to determine their relative positions in the new regulatory dispensation, which was

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[64] This follows Crompton's (1998:6) description of the allocation of costs; however, it was not as simple as that, since the 2c/l was extracted from a series of levy payments (to fund the synfuel subsidy and the mothballing subsidy), which were funnelled via CEF to the beneficiaries in a very opaque way; thus, it is not clear whether the parties concerned actually lost out in the long run, since the temporary adjustments did not affect the *payment mechanism* for subsidies or mothballing compensation payments, but merely the *collection mechanism*. Mothballing payments were in any case halted in 1994.

[65] See introductory section for more detailed discussion. The change in marker refineries was significant, since it was rumoured that the oil majors operating in South Africa which owned these refineries used their posted prices to boost the South African regulated price. Caltex's refinery in Bahrain, for instance, was apparently the only refinery which still used posted prices in the 1990s, for which reason it was kept in the IBLC. This at the very least was a political problem.

primarily a strategic struggle. The process was complicated by another factor: the existing government was represented by the DMEA, which, apart from a knee-jerk commitment to the existing system, could not present a policy position on behalf of government, which changed halfway through the process (Crompton 1998:10), and the ANC (the government in waiting), which was not directly represented, did not have a clear liquid fuels policy position. Principled hostility to the whole liquid fuels establishment in South Africa, developed during the oil embargo, was gradually replaced by a more pragmatic attitude, especially to Sasol: Tito Mboweni[66], then on the ANC Economics Desk, announced that as a result of "recent research", Sasol would henceforth be regarded as a national asset, which could potentially contribute to national development (Cape Times 8/10/1993). However, union delegates to the LFITF failed to get a commitment from the ANC's leadership to a more specific policy position:

> "Despite briefings and meetings with senior ANC leaders it proved impossible to raise the issue sufficiently high on the ANC's agenda to extract a formal policy position, a shortcoming which persists to this day" (Crompton :1998:9).

The unions' position was that they were "ideologically opposed to deregulation" (Crompton 1998:9). One of the key union representatives, Rod Crompton[67], was quoted in the media as saying "..there is no possibility of deregulation in South Africa – only of who controls regulation", and went on to say "..labour favours a middle-of-the-road policy of benign regulation, with an independent regulatory authority and government having the final say.. ..our model would leave room for competition, wherever possible.." (quoted in Financial Mail 11/3/1994). The ANC's 1994 Draft Minerals and Energy Policy Document (African National Congress 1994a) is an elaboration of this position, favouring a process of 're-regulation', and the phasing out of subsidies for the synthetic fuels industry over a number of years, a position which was largely defined by the union participation in the LFITF.

The business caucus, on the other hand, was supportive of deregulation; in addition to a strong ideological commitment to the market,

> "..there was an antipathy from the broader business community towards Sasol and the oil companies who were believed to be benefiting unduly from the state.." (Crompton 1998:8).

This view was not shared by some business constituents such as the MIF and the taxi industry (Crompton 1998:8), and the business caucus included both Sasol and the oil companies, whose position was somewhat more complicated.

As alluded to above, criticism in the business press since 1991 was directed at the regulatory system in general, but the synthetic fuels industry was perceived to be at the heart of the regulatory system,

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[66] Now Reserve Bank Governor

[67] Dr Crompton later became the DME's Chief Director of Hydrocarbons, heading the liquid fuels policy function in the Department.

and singled out for specific attention. By 1993, the oil companies began to take advantage of this: up to then they had been unmoving in their support for regulation, but a change in direction was signalled in October 1993 through a public attack on Sasol by the CEO of Engen[68]. Engen's role was decisive, as reported by the Financial Mail:

> "Until recently, the oil companies and especially Sasol, were also fierce opponents of deregulation. But last year Engen broke ranks with the other companies and last week it succeeded in getting the industry to agree to a phased deregulation" (Financial Mail 11/3/1994).

This was strategically appealing to the oil industry, since the synthetic fuels industry had become symbolic of the regulatory system and its negative connotations; as the Financial Mail noted; "..in the fight to scrap these costly controls, Sasol and Mossgas have become the main target" (Financial Mail 8/10/1993). The main strategic goal of the oil industry was to undermine Sasol's dominant position in the industry, which was largely a result of the regulatory system; to achieve this, they chose to attack the synthetic fuels subsidies. Taking a pro-deregulation stance had two advantages: first, it aligned the oil companies with the business constituency against Sasol, and second, given the uncertainties of the new order, deregulation was a safer option since it had more known parameters. In reaction, Sasol declared itself in favour of 'phased deregulation', which became the central policy mantra of both the oil industry and Sasol. This formed the basis for a *rapprochement* between the liquid fuels industry and the business constituency, which announced in March 1994 that the business delegation had reached consensus on "..the need for phased deregulation" (Financial Mail 11/3/1994, Crompton 1998:8). Ultimately, however, aside from the ideological differences within the Task Force, agreement could not be reached in the LFITF on the way in which the regulatory system could be reformed, which was partly on account of the complexity of the system (Crompton 1998:12).

Much attention was focused on the question of the Sasol subsidy, which was tackled, after months of negotiation, by the commissioning of an independent study by Arthur Andersen on the Sasol subsidy (Mossgas was not considered). The Report considered three key issues: whether it was desirable from a national interest point of view that Sasol's synthetic fuels business[69] continue to operate; what type and level of subsidy would be necessary to keep the synthetic fuels business in operation; and what kind of subsidy regime would be 'fair' to shareholders in the light of the commitments made by government in the privatisation process. The report concluded, on the basis of a return-on-assets calculation, that Sasol Synthetic Fuels (SSF – the synthetic fuels division within the Sasol group) and shareholders had received above-average returns on investment (Arthur

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[68] The successor company to Mobil, which disinvested in the late 1980s. Engen's leadership were thus not part of the 'old guard', which was significant.

[69] By this stage, the synthetic fuels business was only a part of Sasol's total business, which included crude refining (Natref), petrochemicals, coal mining and industrial gas production; it was thus conceivable that Sasol could convert or scrap its synthetic fuels operations and continue its other group activities.

Andersen 1995:82-84,89), but that abolition of the subsidy would lead to below-average returns; the subsidy should thus be pitched at a level which a) fulfilled government's contract with shareholders to guarantee a reasonable rate of return, and b) would not result in SFF shutting down. The latter condition was an outcome of an assessment of Sasol's positive role in the economy, the key feature of which was the contribution which Sasol made to savings in foreign exchange (Arthur Andersen 1995:1). The assessment was based on a report from the Central Economic Advisory Services, an institution which evolved from the economic planning and co-ordination processes based in the Department of Planning in the 1970s, and linked to the office of the Prime Minister, which had been responsible for co-ordinating much of the oil security strategy, and was couched in the familiar language of the decision-making processes which characterised the oil security strategy. The reliance on an apartheid-era assessment of the strategic importance of SSF[70] (in the absence of a new policy framework), as well as the uncritical acceptance of government's ongoing compact with Sasol's shareholders, significantly narrowed the range of possible outcomes.

The conclusion of the study was that subsidies should continue, but at lower levels, and be progressively reduced[71]. The report was not accepted by the oil companies, who walked out of the business delegation when their request to be represented through a minority opinion was turned down (Crompton 1998:13, Interview with oil industry executives). Without the oil majors, the LFITF's status as a consensual transitional policy arena was undermined, and after recommending to government that the Report's recommendations be accepted, it held its last meeting in August 1995 before dissolving, leaving the broader questions unanswered.

The next significant development in post-apartheid liquid fuels policy was an initiative to develop an Energy Policy White Paper. The process began with an Energy Policy Discussion Document (1995), or 'Green Paper'. The aim of the Green Paper was to outline a set of options for each policy issue, in an effort to encompass a set of widely divergent views; although the Green Paper was significant in delineating options, it did not propose a new policy framework as such. A draft White Paper was circulated in 1996, which for the first time contained a post-apartheid liquid fuels policy framework. The process was delayed by a change in Minister, after the withdrawal of the National Party from the Government of National Unity. Not only was an ANC Minister of Minerals and Energy appointed, but a wide-ranging transformation process was set in motion in the DMEA, which displaced the apartheid-era leadership which had worked on the Draft. The final draft was only produced in 1998, and after parliamentary hearings, the final White Paper was tabled at the end of 1998. The evolution of key policy issues is traced in Figure 6.15 below.

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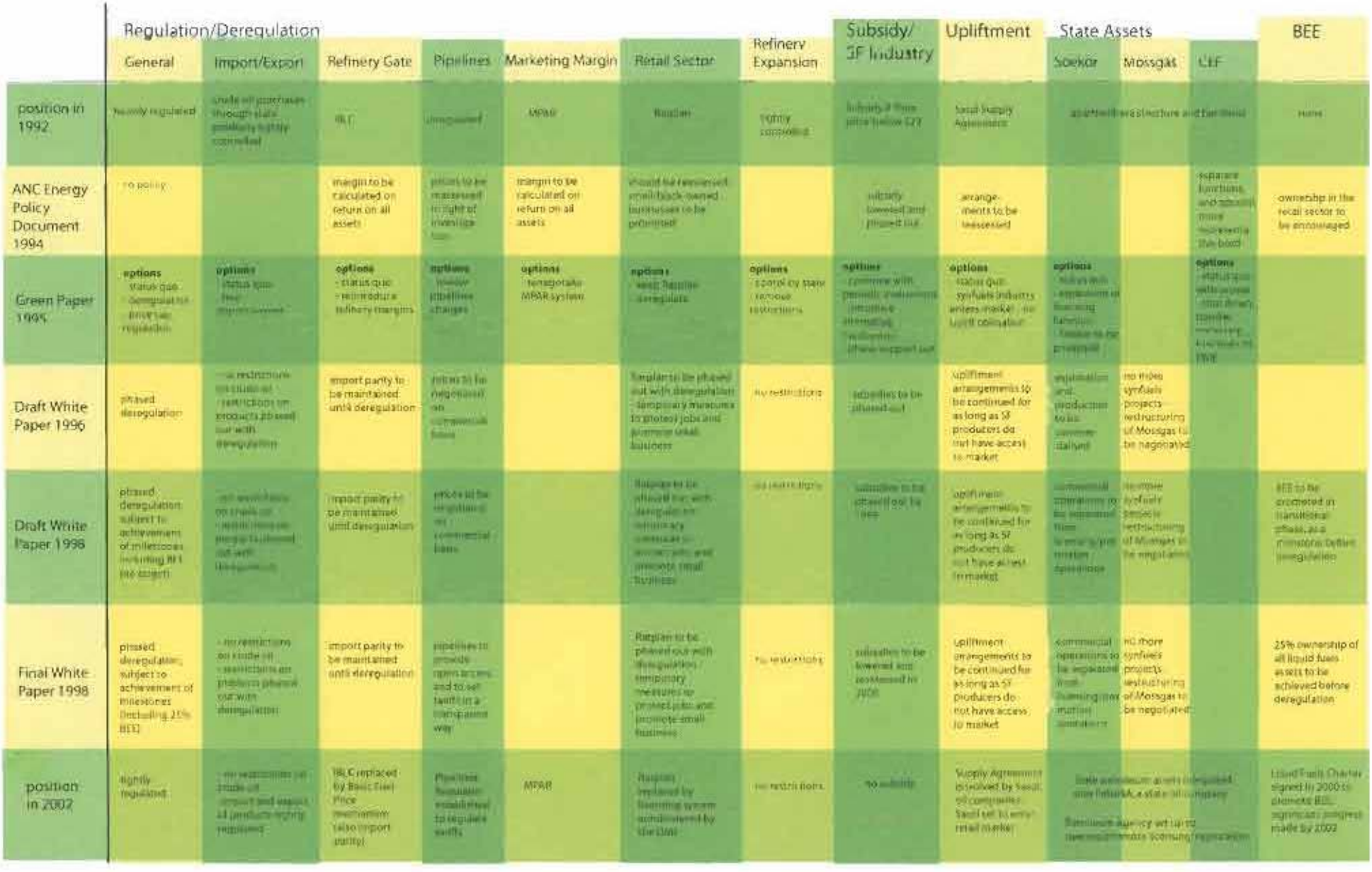
[70] Which is not to imply that Sasol's contribution to foreign exchange savings is *not* valuable.

[71] There was no mention after this of the obligation Sasol had to pay the subsidy money back if the oil price climbed above a 'ceiling', which was an important part of the original arrangement.

Figure 6.15: Evolution of Liquid Fuels Policy Process During the 1990s



The key feature of the liquid fuels component of the White Paper was a process of 'phased deregulation', which included a process of phasing out the synthetic fuels subsidy. From 1995 to 1998, the key addition to liquid fuels policy was the issue of ownership and control of assets in the liquid fuels sector by previously disadvantaged South Africans, or Black Economic Empowerment (BEE), which became a central feature of liquid fuels policy in the new century. BEE first made its appearance in the ANC's Mineral and Energy Policy Document in a very limited way, in a stipulation that service station ownership by previously disadvantaged South Africans should be encouraged by retail regulation, and only emerged in the 1998 draft White Paper as a 'milestone' to be achieved before deregulation. Since the government foresaw deregulation as a process which would supersede the existing regulatory system, there was no real reconsideration of the system as it existed in the White Paper. Instead, deregulation was outlined as a process which would pass through three phases (1998 Energy Policy White Paper:81-82). The first phase would involve the achievement of a set of 'milestones', which included:

> "..the sustainable presence, ownership or control by historically disadvantaged South Africans of approximately a quarter of all facets of the liquid fuels industry or plans to achieve this" (1998 Energy Policy White Paper:81),

as well as the introduction of appropriate governmental capacity to monitor the industry and counter monopoly abuses, satisfactory arrangements for the marketing of synthetic fuels, measures to address potential unemployment as a result of deregulation, measures to regulate liquid fuels pipelines if necessary, and measures to promote small business in the retail sector. The second phase would involve the scrapping of price regulation, import control and the Ratplan, and the third would be a "post-regulation transition phase" involving monitoring and possible corrective action where necessary. The deregulation scenario was the outcome of a rapprochement between the oil majors and the new energy bureaucracy in 1997, which involved not only a trade-off between deregulation and BEE, but also the continuation and application of the MPAR mechanism, which the new government had threatened to repudiate (Interviews with oil industry executives, DME staff).

1999 and after: 'Regularisation' and Black Economic Empowerment

Two key processes characterised the development of liquid fuels policy in the five years after the White Paper: the signing of a Liquid Fuels Charter by government and the liquid fuels industry, and a process of 're-regulation', or 'regularisation'. The Charter, a ground-breaking agreement which has since been emulated in many other sectors of the economy, was a commitment by liquid fuels companies to facilitate the transfer of 25% of all facets of the liquid fuels industry to historically disadvantaged South Africans, and also included a range of commitments regarding employment equity and capacity building (Liquid Fuels Charter 2000:14-17). The Minister however did not

specifically mention deregulation in her speech at the launch of the Charter (Liquid Fuels Charter 2000:5-9). Although the mid-1990s led to a proliferation of independent black-owned liquid fuels companies (most of which were very small and confined to marketing), by 2002 the dominant model for significant black participation in the liquid fuels industry was in a partnership with one of the 'big six' existing companies. The Charter thus had the effect of reinforcing the structure of the industry, which was also reinforced by the regulatory system[72], and by 2005, all major liquid fuels companies except one had finalised deals with BEE partners.

Policy developments after 2000, however, did not develop in the direction of deregulation, but rather in a direction which can be better defined as 'regularisation', or 're-regulation', which was a process of formalising the existing regulatory arrangements inherited from apartheid, most of which depended on unsigned agreements between the key actors. This process was hastened by pressure from the Competition Commission, which had been constituted in terms of the 1998 Competition Act, which had far more extensive powers than previous competition authorities, and swiftly warned the liquid fuels industry that many of these arrangements contravened competition law. The key targets of authorities were the Ratplan and the Sasol Supply Agreement. In the late 1990s, Sasol gave notice, as required by the agreement, of its intention to enter the retail market, at which point the agreement would no longer be in force. This occurred in 2004. The Ratplan was superseded by a licensing process, administered by the DME, in terms of the 2005 Petroleum Product Amendment Act. The IBLC was superseded in 2002 by a Basic Fuel Price, which was an import parity price designed to accurately simulate the importation of liquid fuels into South Africa, and thus based on spot prices in likely markets, including the Gulf and the Mediterranean. The oil industry successfully lobbied for an additional element, which would represent the cost of maintaining storage facilities and stocks if one was actually importing liquid fuels in the volumes which the South African market would require. Price regulation was applied to the petroleum pipeline network in terms of the Petroleum Pipelines Act (2003), which established a Pipelines Regulator to set tariffs. No restrictions apply to refinery expansion or new refinery building, or to the importation of crude oil. The synthetic fuels subsidy was phased out in 2000, although the crude oil price was high enough before and since for subsidies not to apply. The state oil assets (Mossgas and Soekor) were restructured into PetroSA, the state oil company, and the licensing section of Soekor was separated, and established as an independent agency, the Petroleum Agency of South Africa. CEF remains the holding company of PetroSA, as well as the SFF, the role of which has been limited to maintaining 90 days of crude oil stocks.

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[72] Whereas the underlying economics of the industry would certainly limit new participants in refining/manufacturing liquid fuels, the regulatory system, and particularly the way in which it linked refining and import controls, tended to limit new participants in liquid fuels marketing. By comparison deregulated markets such as the UK have a relatively large number of marketers.

Conclusion

The liquid fuels industry in South Africa had throughout its history been awarded a special status. From the 1930s to the 1950s this was justified by the nature of the petrol retail industry, which had certain unique features, and from the 1960s onwards this justification was augmented by its strategic status. This special status was primarily characterised by an exemption from competition legislation, which led to a range of formal and informal institutions within the industry to facilitate co-operation between individual companies, and between the industry and government. Thus, the strategic focus of individual companies was not primarily on competition within the liquid fuels market, but, as one interviewee put it, on "managing government":

> "The most important thing about making money as an oil company in South Africa, was not how well you serviced the market, it was about how you managed government; that *was* what profitability of the oil industry was about.. ..that's why the commercial market was *many times* the profitability of any other commercial market in the world; in orders of magnitude, not just once or twice – ten times more profitable" (Interview with Oil Industry Executive).

Although this strategic orientation is common in many regulated (or merely oligopolistic) industries, the level of co-operation within the liquid fuels industry and between industry and government in the case of the liquid fuels was striking, which lends particular importance to the analysis of policy networks in this context, since state/industry interaction was highly institutionalised in most instances. The regulatory regime which developed in the early history of the industry established an institutional structure which significantly influenced its subsequent development, not least by establishing patterns of interaction between the state and industry. These patterns were preserved and elaborated when the state itself became an actor in the liquid fuels industry in the 1970s, and a surprising number of features of the regulatory system were perpetuated in the post-apartheid era.

The development of state/industry interactions began with disputes between different state agencies in the 1930s concerning the applicability of competition principles to the petrol market. The first of these, the Department of Commerce and Industry, saw liquid fuels policy (which at that stage only covered importing and marketing of fuel) as 'service station policy': problems in liquid fuels policy were thus addressed as part of a larger set of problems with the service station industry in general, including workshop standards, complaints about cars sold, and so forth. The two key policy problems were viability of service stations and levels of service. The solution to these problems conceived by the oil industry and the service station industry was to control the number of participants in the market, and set prices; this solution was endorsed by the Department. The other state agency which took an interest in the issue was the BTI, which saw liquid fuels policy as a competition issue. After a process of contestation between the BTI and what had become a policy

community consisting of the oil industry, the service station industry and the Department of Commerce and Industry, the BTI was marginalised, and further critiques of the industry by competition authorities were ignored until the late 1990s.

The 'special status' which allowed the policy community to marginalise the competition authorities so successfully developed in three phases. In the first phase, from the 1930s to the 1950s, the case for the industry's special status was weak, and based on one of a number of possible solutions to the problems outlined above. For this reason, the competition authorities were relatively successful in periodically reversing gains made by the industry away from competition. In the second phase, from the 1950s to the 1960s, a new dimension was added: an indigenous refining industry, which the state was eager to promote. A new comprehensive regulatory system was introduced, which regulated the whole value chain, and also imposed various other protectionist measures, including restrictions on imports, restrictions on new refinery construction, and preferential tariff measures. An additional aim of this protection was to protect the state's small synthetic fuels plant, Sasol 1. Liquid fuels policy was integrated via the regulatory system, and the Department of Commerce and Industry saw the regulatory system as indivisible (both in terms of the value chain, and in terms of the actors involved, which were the same); thus, the industry's special status was further protected through the state's wish to promote the refining industry, and to protect the nascent synthetic fuels industry. In the mid-1950s, the refining industry was included in the regulatory system, and in 1960, with the introduction of the Ratplans, the industry's special status was entrenched.

The final stage, which put the industry out of reach of competition authorities, was the development from 1960 onwards of the credible threat of an oil embargo, which lent the industry a strategic aspect, and heightened the requirement for co-operation amongst the industry, and between the industry and the state. Price regulation of the whole value chain was formalised in terms of the Price Control Act in the early 1960s, and by then, policy measures, regulatory measures, and even operational details were brokered by a policy community in which the commercial section of the Department of Commerce and Industry was the dominant agency; it administered the IBLC, negotiated each Ratplan with the oil industry and the MTA/MIF, and policed imports and exports. Other state policy goals such as Afrikaner empowerment were negotiated through the Ratplan or in other committees on which the state and the industry were represented. The result of this was that there were almost no new entrants to the market; in the 1950s, the French company Total entered the market, but after 1960, the only new entrants had political backing (the Portuguese company Sonarep, and the Afrikaner-empowerment company Trek), and their entrance was negotiated by the state through the Ratplan. Refining remained a preserve of the 'big four'. In institutional terms, by the 1960s a set of non-statutory committees was established (the Ratplan is the key example), on which the oil industry and officials from the Department of Commerce and Industry were

represented, through which key policy and regulatory issues were negotiated and resolved. Within the industry itself, routines for dealing with intra-industry conflicts (concerning amongst other things, market encroachment) and for co-ordinating interaction with the state, were institutionalised. In the 1960s, however, there was a significant change in the state's approach to liquid fuels policy, brought about by the threat of the oil embargo from 1960 onwards. The state considered a number of strategies, including investing in its own tanker fleet, but finally it was decided to a) initiate an exploration programme, and b) establish a significant strategic stockpile of crude oil, and also an inland refinery. The first initiative was not successful, but the second involved the development of a state-owned presence in the liquid fuels industry, which was achieved through its small existing asset, Sasol, in which resided an existing pool of expertise on the industry. The initial impact of the strategy on the existing industry was minimal, since it was limited to a relatively small-scale strategic storage scheme: the only significant outcome for the industry was the location of the Caltex refinery, which was apparently influenced by state pressure, since Cape Town was a more appealing location from a strategic point of view than from a commercial point of view.

The turning point, however, was the decision to build the Natref refinery, which had a number of impacts on the existing liquid fuels industry and the liquid fuels policy community. The first was that it set back the industry's plans for another refinery, due to be built by Trek (in which BP and Shell had a significant stake). The second was that Sasol, who with the IDC managed the strategic stocks and the associated funds, and who would own and operate the new refinery, developed into a significant actor in the liquid fuels industry. The third and most significant outcome was that a new centre of influence developed in liquid fuels policy: the oil security strategy was not developed in the existing policy community, but within the state's industrial policy elite, which, unlike the existing liquid fuels policy community, was well-integrated with both the political elite and the state's economic and industrial strategic planning processes. The different elements of the strategy were formulated and implemented in the 1960s and 1970s through a different section of the Department of Commerce and Industry dealing with industrial development.

This bifurcation of state influence in liquid fuels policymaking posed various difficulties for all the main actors: the oil industry was threatened with state-sponsored encroachment on its markets by Natref, which was located nearer to the prime liquid fuels market in the country than any other refinery (other than Sasol, whose output was by then an insignificant share of the market); the state, on the other hand, needed to maintain its 'infrastructural power' in respect of the oil industry, since its co-operation was vital for the success of the oil security strategy. The way in which the problem was resolved was to limit Sasol to behind the refinery gate, thus maintaining marketing and retailing of liquid fuels as the exclusive preserve of the oil companies, on condition that they bought all of Sasol's product at an agreed price. It was also made clear to the oil companies that the regulatory

regime would not be a hostile one, and that they would be well-protected from competition. Thus, by the end of the 1960s, there were two spheres of influence in liquid fuels policy, which were articulated by a regulatory entente. The division was enhanced by a split between the commerce and industry functions of the Department of Commerce and Industry in the late 1960s; however the entente led to an unusually-structured variation on a policy community. The centre of influence moved from the oil industry/commerce centre of influence (hereafter centre 1) to the Sasol/IDC/industry centre of influence (hereafter centre 2), which became the focus of key policy developments in the 1970s. However, there was considerable interaction and negotiation between the two clusters, which in terms of the Chapter 1 criteria comprised a single policy community. The oil companies however played a subordinate but vital role during the 1970s and 1980s, and their co-operation with the state was indispensable in implementing the oil security strategy.

Developments in the oil security strategy in the 1970s enhanced both the institutional influence of Sasol and the second centre of influence, and Sasol's market share of liquid fuels manufacturing, until by 1982 it was manufacturing more than half the liquid fuels requirements of the country as well as managing all the other elements of the oil security strategy except for exploration. The seminal decisions to build the Sasol plants had been made (on the basis of strong representations by Sasol) by the Energy Policy Committee, which became a third centre of influence, and the means by which the synthetic fuels programme was co-ordinated with other aspects of industrial and economic policy; this co-ordination was also facilitated through Sasol's links with the IDC. However, the role of the EPC was limited in terms of liquid fuels policy generally: decisions on regulatory issues were still the preserve of centre 1, and oil security strategy issues such as crude procurement and strategic storage issues were the exclusive preserve of centre 2. As a result, developments in the synthetic fuels programme were not well co-ordinated with developments in the rest of the industry, an example of which was the refinery expansions in the 1970s. By the end of the 1970s, it was necessary to extend the existing agreement with the oil industry concerning Natref's production to cover the production from Sasol 2 as well, which also involved the introduction of a significant subsidy, paid through a fuel levy, in addition to other levies used to fund Sasol 2's construction, crude procurement and the strategic stocks programme.

By the end of the 1970s the oil embargo had finally become a reality as Iran cut off oil supplies, and the accession of P.W. Botha led to a civil service reorganisation, which included the centralisation of all liquid fuels functions in government in the DMEA. In reality, it took another five years for full integration to be achieved. The necessity for more integration of liquid fuels policy processes was related to two developments. The first was the development of Sasol 3, which required a significant renegotiation of the regulatory system in order to accommodate Sasol 3's production and compensate the crude refiners for mothballing some refining capacity: the state had to ensure that

the regulatory system provided the oil industry with enough incentive not to disinvest, which it did, except for Mobil, which was compelled to disinvest for legal reasons (US legislation) in the late 1980s. The second was the privatisation of Sasol (1979-1991, with the bulk transferred by 1983), which led to the withdrawal of Sasol from managing the Funds, the strategic stock, and the crude procurement programme in 1984. This development led to the establishment of a holding company, CEF, to house the SFF and other oil security strategy assets and activities, which was a way in which the strategic aspects of the oil security strategy could be kept institutionally separate from the more routine policy and regulatory aspects of the state's involvement in the liquid fuels sector; in addition, CEF was seen as a facilitating agency for the post-Sasol synthetic fuels programme. At the same time, in 1980 the DMEA embarked, with the EPC, on the development of a long-term synthetic fuels policy, and CEF was appointed the core agency in its development. CEF functioned not only as a holding company for the Funds, but also as a conduit for funding from coal, electricity and liquid fuels levies to finance the NEC. Sasol's influence and its membership of a liquid fuels policy inner circle persisted for some time after its privatisation, and maintaining its presence in the liquid fuels policy community was one of the motivations for appointing 'private sector' representatives to the EPC.

One of the state's motivations for developing the oil security strategy in the way that it did was to create an influential bloc in the liquid fuels industry which consisted of 'insiders', which they had begun to do in the 1960s through various incomplete Afrikaner empowerment ventures: the privatisation of Sasol completed this process. After the completion of Sasol 3, the synthetic fuels programme was not a success for a number of reasons, and the only outcome was Mossgas, which was a fiasco, for reasons outlined above. An additional institutional outcome of the oil security strategy in the 1980s was the imposition of secrecy legislation in 1979, which had a significant impact on the way in which liquid fuels policy processes were conducted, and the way in which these were integrated into broader energy policy processes. The divisions between strategic and non-strategic aspects of liquid fuels policy was hardened. The centre of the secrecy regime was the importation of crude oil; as a result, only a small number of officials involved in oil procurement knew how much oil South Africa imported, or even how much was processed annually by the refineries. The private refining companies also segregated crude procurement functions physically and institutionally within their organisations, and these isolated departments liaised with the state officials: beyond this group, information on crude imports and production by refineries was not available, even to relatively high-ranking officials in the DMEA.

The beginning of the transition removed any further impetus to develop the synthetic fuels programme, and the uncertainty which it engendered in the policy environment led to a policy crisis in late 1993 centred on a public revolt over a petrol price increase. The disappearance of the

strategic imperative undermined the apartheid-era balance between the two centres of power in the policy community: although the separate state agencies in the centres had been integrated in the DMEA, Sasol still had strong links with an economic and industrial policy elite. The outcome of the 1993 policy crisis consisted of two processes. The first was a struggle between the oil majors and Sasol, in which the majors wished to reassert their dominant position, both institutionally and in the market, and the second was a process of building relationships with the emerging anti-apartheid state. The role of the LFITF episode was a key point in this process, through its legitimation of Sasol's role in the national economy and its subsidy, as well as the legitimisation of liquid fuels price-setting procedures, which addressed the immediate causes of the policy crisis. Sasol's victory was notable for two reasons: first, the way in which the inquiry was framed, as well as the way in which its broader importance to the country was assessed, was significantly influenced by apartheid-era planners (still in position in 1995); and second, its victory was more significant as a form of post-apartheid legitimisation than in terms of the maintenance of the subsidy, which was phased out over the next four years. In 2001, Sasol joined the oil industry association SAPIA, an indication of a fragile truce between Sasol and the refining industry.

Although the oil majors took a strong position on deregulation, as did the state in the White Paper, in reality when the uncertainty that the new state entailed disappeared in the late 1990s, both the state and the liquid fuels industry toned down pro-deregulation rhetoric significantly, and a process of 'regularisation' followed, which formalised the apartheid-era regulatory system. Some of the more excessive aspects of the apartheid regulatory system were abolished: the IBLC was reformed, pipeline charges were subject to independent regulation, the Natref 'neutrality' principle was phased out, CEF and SFF were restructured, the Ratplan was replaced by a licensing system based in the DME (under pressure from the competition authorities), and synthetic fuels subsidies were phased out. However, marketing and retail margins were not subject to reform, import restrictions still remain, and the regulation of the value chain has a similar form. The main watershed in the relationship between the post-apartheid government and the liquid fuels industry was the Liquid Fuels Charter, which was the formalisation of a process which began with the appointment of an ANC minister in 1996. The post-apartheid policy consensus consists of a commitment to phased deregulation of the liquid fuels industry as BEE targets are met by the industry, combined with the reality of post-apartheid liquid fuels policy (re-regulation), which is supported both by industry (whose commitment to deregulation weakened as uncertainty about the new order disappeared), the new leadership in the DME (who are committed to re-regulation), and the political leadership (who are committed to BEE). One striking lacuna in post-apartheid liquid fuels policy is the absence of energy poverty policy pertaining to liquid fuels, since liquid fuels use by poor households both causes the most acute problems (IP) and poses the best solution (LPG). Unlike in the electricity

sector, a deal was not concluded between industry and the ANC to address energy poverty. The only notable initiative was the establishment of a paraffin safety association by the liquid fuels industry, which does publish useful annual data on the rate of paraffin-related accidents and fatalities in households. The reasons for this are complex, but a few points are pertinent. First, the EDRC policy activists, who played a key role in brokering the electrification programme, had not developed a detailed understanding of the liquid fuels industry[73], partly on account of its traditional secretiveness, and partly on account of the willingness of Eskom to engage, and the concomitant focus on electricity. Moreover, some of the key activists were also employed in the electricity sector. Second, differences in the aims and functions of the two negotiation forums played a major role: the aim of NELF was electrification, and other agendas were attached to this, whereas the aim of the LFITF was to legitimise the regulatory process. Third, a basic institutional fact was that there was no equivalent of Eskom in liquid fuels – an agency which could provide organisational capacity, institutional legitimacy, and capital. The last reason was the way that the problem was understood: in the early 1990s, the problem was considered to be lack of electricity, and for those without access to electricity, the problem was to make IP safer and cheaper. Only after 2000 did a consensus emerge that the problem was the price of LPG[74]; in other words, a liquid fuels policy problem linked to the structure of the LPG market. This problem still remains to be addressed.

In terms of the relationship between liquid fuels policy and energy policy, the policy regime up to the 1970s fits uncomplicatedly into paradigm 0. Unlike in many other countries, there was extremely limited substitution of liquid fuels for coal, and no state initiatives to accomplish this, and thus no corresponding paradigm 1 institutions were established before 1973. The limits of the liquid fuels market were defined clearly and fairly rigidly in the energy system. HFO was largely exported or used as refinery fuel, and had very limited use in industry or electricity generation. The turning point was 1973, and integration of liquid fuels policy occurred in two phases, in the 1970s and in the 1980s. In the first phase, from 1973 to 1979, the coal-oil nexus was the core of the state's energy policy project: however, in terms of decision-making patterns, 'energy policy' really only extended to the substitution of oil by coal in the 1970s, and other liquid fuels policy matters were kept out of the energy policy community. Bearing in mind that the context was different (not created by economic or structural factors, but by the threat of the oil embargo), the oil substitution programme resembled coal substitution programmes in the 1950s and 60s elsewhere. The limited

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[73] A detailed report was compiled in 1993 on the paraffin value chain, but permission to publish it (required under still-existing secrecy legislation) was denied by the Cabinet.

[74] In most countries, including developing countries, households commonly use a combination of electricity and gas (either bottled – LPG – or piped natural gas). South Africa is unusual in that households which have access to it, and can afford it, use solely electricity, which led energy analysts to classify LPG as a 'transitional fuel', which would be used by households in a 'transition' from cheap unpleasant fuels (coal/wood) to expensive 'modern' fuels (electricity). Most middle-income developing countries (in which category South Africa falls) have relatively high per-capita LPG consumption figures, but South Africa does not, mainly on account of the price of LPG, which is far higher than economic analyses suggest it ought to be (it is not regulated) in a free market.

penetration of liquid fuels outside of the transport sector was rapidly reversed in the 1970s, partly as a result of government encouragement, and partly on account of market forces responding to the massive increases in the price of oil. Attempts to mitigate liquid fuels consumption were limited to short-term conservation measures which were "very carefully managed" with the oil industry (Interview with S Van Den Berg), and demand-side measures were eschewed. Aside from the other limitations, the formulation and implementation of paradigm 2 measures would have fallen foul of the delicate balance the state was pursuing between the interests of the oil industry and those of the emerging synthetic fuels industry. Limited institutional capacity was developed to investigate trade-offs in the energy sector, and these were primarily based on modelling coal reserves and demand under various scenarios for electricity and synthetic fuels growth.

A higher degree of co-ordination was brought about in the 1980s with the creation of the DMEA, and the combination of regulatory and other functions in one department, which had several important consequences, of which the most important from an energy policy point of view was the attempt to develop a comprehensive synthetic fuels policy. This involved exploring a number of possible primary energy carriers, including cane sugar and natural gas, and thus was a paradigm 1 programme *par excellence*. Further integration of the oil security strategy functions into the CEF in 1985 represented an interesting innovation, in that CEF was expanded to collect levies from other energy supply sectors (coal, electricity) to fund energy policy-related research in the NEC. However, secrecy legislation, which prevented information flow about liquid fuels even within the state's energy bureaucracy, inhibited the development of more sophisticated and integrated energy policies. The removal of the security imperative in the early 1990s put a halt to further developments of the synthetic fuels programme, and with it the impetus for oil substitution programmes.

The post-apartheid era, begun by a retreat from further oil substitution policies, is characterised by an absence of *energy* issues in liquid fuels policy, which is a reflection on the enduring nature of the South African energy supply system. The only possible candidate is household energy demand, which, if an integrated policy were developed, would lead to a series of tradeoffs between different energy carriers, but this has not occurred. Institutionally, however, the strongest policy capacity in the DME is, as has traditionally been the case since 1980s, located in the liquid fuels section: unlike the electricity sector, regulatory functions in the liquid fuels industry are located in the DME. However, these are extremely limited by comparison to the NER – around 5 to 7 people, as compared to 100. Although there is a significant level of policy activity in liquid fuels in the DME, in terms of energy policy, the post-apartheid era represents a weakening of co-ordination across supply sectors, and a return to the kind of isolated policy-making which categorises paradigm 0.

Chapter 7

Energy Policy Activities in Government

Introduction

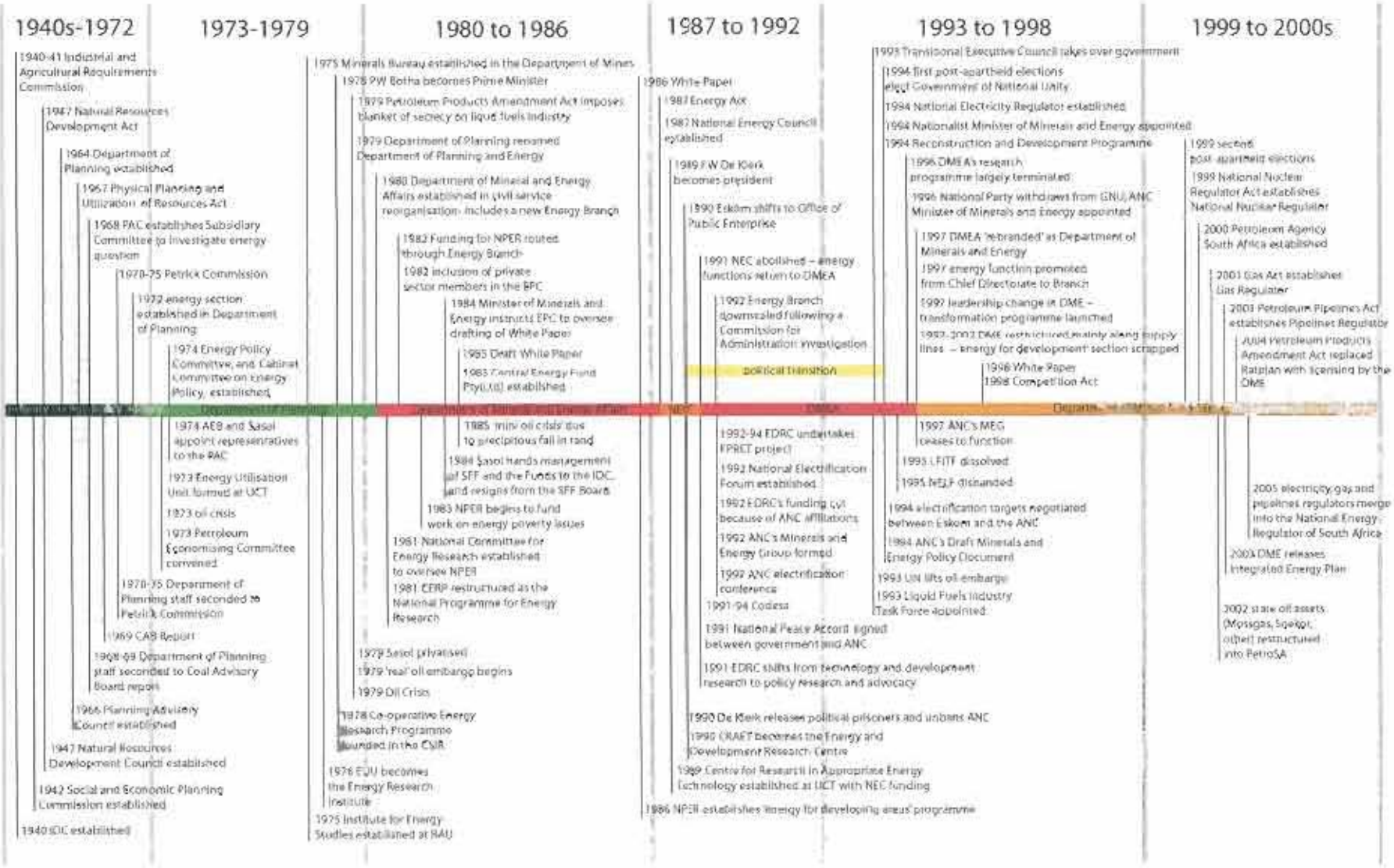
The last four chapters were concerned with the development of policy and institutions pertaining to specific energy supply sectors. In the current chapter, these will be placed in the broader context of the general development of energy policy and institutions in South Africa. By identifying the main points of policy and institutional change, the origins and development of South African energy policy to date can be understood as a series of six phases, inaugurated by key policy crises, and leading to paradigm change or modification. These phases and the key developments within each phase are represented in Figure 7.1 below.

In the first phase, before 1972, policy in different energy supply sectors developed in virtually autonomous streams (corresponding to paradigm 0). The beginnings of energy policy activity in South Africa occurred through the establishment of a small subsection of the state's natural resource planning infrastructure, which in the late 1960s was instrumental in reframing coal policy in terms of strategic resource use. This was cast into sharp relief by the 1973 oil crisis, which raised the possibility of a large-scale synthetic fuels industry, thus linking the two separate elements of the energy supply system, the liquid fuels industry and the electricity industry, through coal, the primary resource. As in other industrialised countries, this convergence led swiftly to high-level support for the inauguration of the energy policy project.

The second phase began with the establishment of the first significant energy policy institution, the Energy Policy Committee (EPC) in 1974, on which were represented the key state enterprises and government departments involved in energy supply, thus representing a variant on paradigm 1, with two central features: the predominance of the strategic imperative, and the focus on coal as the fundamental nexus of the energy system. Actual energy policy capacity in government consisted of the EPC's secretariat in the Department of Planning, but policy and regulatory institutions pertaining to the energy supply industries were based elsewhere in the state system.

The third phase was precipitated by a combination of a further policy crisis and a change in political leadership. The second oil crisis in 1979, less severe in its effects internationally, was disastrous for South Africa, since the country's only remaining supply of oil (Iran) was cut off.

Figure 7.1: Evolution of Energy Policy Functions in Government



The oil security strategy was stepped up: with other measures, the synthetic fuels programme was doubled. At the same time, the energy policy function in the Department of Planning was enhanced, and in 1980, most energy-related policy and regulatory functions were centralised in a new Department of Mineral and Energy Affairs; energy policy was given a high strategic priority. Recurring crises in the early 1980s, caused by the high cost of imported oil and the related decline of the rand/dollar exchange rate, led to the proposal of a new institutional structure in the form of a National Energy Council in 1987, the establishment of which signalled the beginning of phase four. The NEC furthered the integration of energy policy institutions by incorporating the National Programme for Energy Research (previously housed in the state's Council for Scientific and Industrial Research), as well as addressing some of the pressing resource difficulties, but other problems it had been designed to address (further integration of energy governance institutions, the development of energy planning capacity), it failed to do. The experiment was brought to an end by a further policy crisis, which will be termed here 'the crisis of the transition'.

The central feature of this policy crisis, which affected a wide range of policy domains, was the collapse of the strategic imperative, which had been the prime driver in many apartheid-era programmes, in the face of the transitional process: since negotiations had begun with the anti-apartheid opposition, threats such as sanctions and embargos would disappear in the short term. Thus, political support for energy policy activity, which was largely based on strategic grounds, declined precipitously from 1991 onwards. In addition to this, the tightly-structured energy-related and other policy communities of the apartheid era collapsed or were significantly modified as a potentially hostile government-in-waiting emerged. These developments signalled the beginning of the fifth phase, which began with the scrapping of the NEC in 1991, and the reincorporation of its functions into the DMEA, as a smaller and less-influential Chief Directorate, as well as a number of policy processes connected in various ways to the main political negotiating process, culminating in the development of a new Energy Policy White Paper in 1998. The central feature of this period was the accessibility of key policy processes compared to the apartheid era, when energy policy was generally the preserve of a tiny elite. As the new government negotiated with the main energy sector actors, policy processes were 'normalised', policy communities were reformed, incorporating the new political elite and reformed configurations of energy sector actors, and the DMEA was restructured, which inaugurated the final, short phase, from 1998 to the present. This phase was characterised by the formalisation of apartheid regulatory frameworks and the re-establishment of a supply-oriented energy policy consensus focused on regulation and governance of energy industries rather than coal, which did not feature significantly in energy policy deliberations in the 1990s.

In a more detailed description and discussion of these phases below, these developments will be discussed in terms of the energy paradigms framework outlined in chapter 2, in terms of which paradigm transition involves the adoption of a new conceptual framework underpinning the paradigm (the 'system of ideas'), a set of corresponding problems, a set of legitimate policy alternatives, and a set of corresponding institutions. The link between these abstract paradigms and the development of concrete energy policy paradigms in specific locales can be explored through the structural features identified in Chapter 2: a 'core' on which there is consensus amongst actors who are members of the energy policy community, consisting of concrete features which delineate the boundaries of the paradigm, and a periphery consisting of institutions and policies related to the 'core' programme.

There are thus two types of change within this framework: the first is a change in the paradigm itself, as the 'core' is significantly modified or replaced and significant institutional reform takes place, and the second is a change within a specific paradigm, as the 'core' is reconfigured, institutions are developed, integrated or excluded, and the structure of the policy community is altered. This in turn required the delineation of policy communities, through the criteria outlined in Chapter 1, in terms of which actors were involved, which institutions were integrated into the policy domain, and to what extent policies were supported politically. The 'core' parameters of the policy paradigm can then be identified, in terms of patterns of decision-making (who makes decisions about what policies), which institutions are included or excluded, and what consensus exists on policy problems and alternatives (including the elaboration of appropriate conceptual frameworks, which usually involves the development of new organisational capacity), and the points of change and the reasons for change can be more clearly understood. In the conclusion, a case will be made for a specific pattern of paradigm changes and modifications stemming from this analysis, in terms of which the development of South African energy policy can be explained and understood.

The Development of Energy Policy Activity

1) pre-1972

The locus in the state where a *general* interest in energy policy *per se* developed was in the state's planning agencies, which were in turn developed to co-ordinate post-war industrialisation policies. The first planning council, the Social and Economic Planning Commission (SEPC), was established in 1942 on the recommendation of the Industrial and Agricultural Requirements Commission (1940-41) which was headed by Van Eck, also at the time the General Manager of the newly-formed IDC (South African Yearbook 1984). The SEPC heralded the development of

a far greater degree of co-ordination between government agencies, parastatals and the private sector in industrial development, in a context in which inter-agency co-operation was traditionally weak.

The first key post-war project with which the state was faced was the development of the Free State goldfields, which required not only massive levels of private capital investment, but also a high degree of co-ordination between mining houses, other private industrial concerns and state agencies, to develop the required infrastructure including railways, electricity supply and water, as well as the social infrastructure, which required a significant level of physical and economic planning. Fine and Rustomjee comment that:

> "The scale of this project cannot be overemphasised.. [contemporary industrial projects] all pale into insignificance compared to the Free State goldfields development of twelve individual gold mines in a part of the country where supporting infrastructure was virtually non-existent. De Kock imparts a striking impression of an interplay between state and corporate planning right down to the last compound for mine workers.." (Fine & Rustomjee 1996:155).

The state agency responsible for co-ordinating this project was the Natural Resources Development Council (NRDC), one of the successor institutions to the SEPC, which was established in terms of the 1947 Natural Resources Development Act to promote resource-driven industrial development. Its first task was to manage the planning process for the Free State gold fields development, after which it broadened its scope, which included the complex local and regional spatial planning processes which had become central to the development of the apartheid state[1], as well as the development of indigenous natural resources and their beneficiation (and the accompanying infrastructure), which was the focus of most industrial mega-projects in the country in the second half of the 20th century. The co-ordinating role of the NRDC, as well as other state planning agencies, was superseded by the formation of the Department of Planning in 1964, the function of which was the national co-ordination of economic, physical and scientific planning and research. The Department was established, according to its first Annual Report:

> "..in view of the growing importance of combined planning and the co-ordination of certain activities in various spheres and with a view to obtaining co-operation in this connection between the public and private sectors of the community.." (Department of Planning Annual Report 1965:1).

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[1] A fusion of racial zoning of urban land and rural regions, regional 'development' of 'self-governing territories' and an industrialisation policy which included an emphasis on 'decentralisation', or development of industries close to or in these territories, which had abundant supplies of cheap labour, but few resources and almost no infrastructure. In addition, under apartheid, the development of large regional industrial projects such as the Free State gold fields or the Richards' Bay project was impossible to separate from the racial geography of apartheid planning in establishing labour-related social infrastructure.

The Department was set up in an attempt to provide a higher degree of co-ordination to a state in the process of rapid industrialisation, which was characterised by a high level of agency autonomy and a lack of strategic co-ordination, where

> "..decisions about state action were determined more by patronage networks within the National Party than by a co-ordinated plan of state action.." (Swilling 1988:3).

Thus 'planning' was, as is often the case, an instrument to broker cross-sectoral policies, and to negotiate the co-operation of state agencies in these initiatives.

The Department of Planning took over control of the Council for Scientific and Industrial Research, the state's central statistical service, and the NRDC, absorbed planning functions already established in the Department of the Prime Minister, and established three advisory councils, the Economic Advisory Council, the Scientific Advisory Council and the Planning Advisory Council, all of which advised the Minister of Planning and the Prime Minister, and were co-ordinated with advisors in the three spheres based in the Department of the Prime Minister, and which were provided with secretariat services by the Department (Department of Planning Annual Report 1967:1-2). The Councils consisted of the top leadership of government departments, parastatals and other state agencies, and occasionally representatives of the private sector on non-strategic Councils, and formed the institutional precedent for the EPC.

The key council from an energy policy perspective was the Planning Advisory Council (PAC), created in 1966, which officially assumed the spatial development and natural resource functions of the NRDC in 1967 with the passage of the 1967 Physical Planning and Utilization Resources Act, which repealed the 1947 Act as well as abolishing the NRDC. The composition of the PAC was significant: amongst others[2], it included the top officials of the Departments of Planning, Finance, Commerce and Industries, and Mines, and the South African Railways, as well as the Chairman of Escom and the Managing Director of the IDC (Department of Planning Annual Report 1967:3). As the importance of energy policy unfolded in the 1970s in the wake of the 1973 oil crisis, the General Manager of Sasol and the head of the Atomic Energy Board joined the Council, making the PAC an extremely high-level forum for co-ordinating strategic developments and policy across government and parastatals related to energy and natural resource policy. Representatives of the private sector, appointed to the original Council, were mostly eliminated at the beginning of the 1970s (Department of Planning Annual Reports 1967, 1972, 1974) as the Council began to deal with issues of strategic importance.

Interest in the energy economy as a whole by government occurred briefly in the 1930s, when a survey of the energy commodities used in the Union (coal, electricity and liquid fuels) was derived from the industrial census in response to a request from the World Power Congress, later

[2] The PAC also included other state agencies with interests in regional or resource planning, and a few well-connected experts.

the World Energy Council (South African Yearbooks 1933-1936). A more systematic concern with energy emerged for the first time in 1966, when the PAC began to express an interest in "trends in the consumption of energy in the Republic" (Department of Planning Annual Report 1967:3). In reality, however, the Department of Planning lacked any capacity to carry out any such assessments. A key development was the appointment of Dr W.C. Van Rensburg in 1967 in the area of natural resources planning and development, who began to develop a capacity in the Department to consider energy issues (Hofmänner 2002:221). In 1968, the PAC established a Subsidiary Committee to investigate

> "..tendencies in the energy consumption in and future requirements of the Republic, and also to evaluate the various sources and reserves of energy" (Department of Planning Annual Report 1968:6),

which was the first use of the category 'energy' in this context in government. Van Rensburg's first activity was to complete a ground-breaking survey of the nation's coal resources (see Chapter 3), in collaboration with the Fuel Research Institute and the Geological Survey (in the Department of Mines), under the auspices of the Coal Advisory Board (Department of Planning Annual Report 1969:9). The survey placed the question of coal reserves in a broader energy policy context for the first time, a conceptual shift supported elsewhere in the state, particularly by Sasol's leadership, who were centrally involved in developing and implementing the state's oil security strategy (see Chapter 6), and had ambitions to scale up the limited synthetic fuels industry then in operation.

The Department of Planning's decision that the investigation (which was headed and mainly undertaken by its own staff) be placed under the auspices of the CAB[3] was a shrewd strategic move designed specifically to a) circumvent the existing coal policy community, dominated by a narrow market-based regulatory focus, b) capitalise on the CAB's mandate, which was to advise the Minister of Mines on coking coal resource use (by extending it), and thus, c) place the coal policy debate in a resource-based context rather than in a market-based context. The 'coal problem' had begun to turn into an 'energy problem', due largely to an emerging triangle between coal, liquid fuels and electricity, and the strategic awareness that arose through the coal survey of the possibility that it was very likely that strategic tradeoffs would be required between electricity, liquid fuels security (assuming an enlarged synthetic fuels industry) and coal exports. The survey led directly to the appointment by the government of the Petrick Commission in 1970, to which Van Rensburg was appointed. The completion of the coal survey delayed a more comprehensive investigation of energy use, which was lamented in the Department's annual

[3] The investigation was in fact the only significant act that the CAB performed, and certainly the only high-profile one.

report on account of the potential nuclear developments then underway, as well as the discovery of natural gas offshore:

> "With the discovery of gas on the continental shelf[4] it has become necessary to investigate the potential markets for gas and other sources of energy, but this work has inevitably been delayed to a certain extent by a shortage of qualified staff" (Department of Planning Annual Report 1969:11).

Coal, gas and uranium were all natural resources, the usefulness of which could be assessed by existing routines; however, the Department had no existing capacity to evaluate them as *energy resources*. The structural conditions for the emergence of energy policy, which comprised a degree of potential convergence between different energy carriers, which had occurred in many other industrialised countries in the 1950s, were absent in South Africa until the late 1960s; whereas previously economic growth required 'energy commodities' (coal, electricity, liquid fuels), by the end of the 1960s, the economy began to require 'energy resources'. After almost 100 years of hermetic development of key energy supply industries, from a planning point of view it seemed that these contexts were too narrow to make energy supply decisions; the development of gas or nuclear power policy could not take place without considering electricity and liquid fuels policy.

Thus the institutional context for the emergence of the apartheid state's interest in energy policy was natural resource planning, rather than one of the policy contexts of the constituent energy supply sectors; importantly, ambitions to develop a co-ordinated energy supply strategy came from *outside* the existing energy sector-related agencies. In addition, its location in the Department of Planning lent the new area of policy activity a set of institutional resources which had been developed primarily to address co-ordination problems between state agencies in development processes since the 1940s, which both enabled and limited the development of energy policy in the 1970s.

The government's response to both the CAB report and the ongoing Petrick Commission was to expand the natural resources functions of the physical planning division of the Department of Planning; dedicated planning functions were established to develop a co-ordinated approach to the development of both minerals and energy resources. The first dedicated energy policy function was established in 1972, and Dr D. Kotzé, a statistician who had worked in the oil industry on energy demand forecasting, was appointed to head it. Kotzé had completed a PhD in statistics which proposed an econometric model of South African energy demand, which was updated and used as the basis for much of the state's energy planning activities in the 1970s and 1980s (Hofmänner 2002:219-221); his PhD predated the establishment of any energy policy

[4] Gas was discovered off the southern Cape in the late 1960s, as well as off the west coast on the Namibian border.

research activities at South African universities. Thus, the first formulation of basic energy policy goals was contained in the Department's Annual Report in that year:

> "..to promote the optimum utilisation of the country's energy resources and to ensure adequate and strategically safe supplies, at reasonable prices, of various forms of energy essential to economic growth.." (Department of Planning Annual Report 1972:7),

which contained the basic parameters of apartheid-era energy policy until the late 1980s, which were a) a natural resource approach, which emphasised primary energy commodities rather than energy industries, b) the strong energy security element, and c) the basic function of the energy sector as one of the drivers of economic growth.

2) 1973 to 1979

The seminal event in the development of energy policy in the 1970s was the 1973 oil crisis. In the build-up to the crisis, the PAC scaled up its ambitions for a 'comprehensive' approach to energy planning,

> "..emphasising the necessity of implementing an integrated and comprehensive energy programme for South Africa. The establishment of such a comprehensive programme comprises the following:
>
> a) The collection and analysis of economic and energy data
> b) A projection of future energy consumption as deduced from economic forecasts, or at any rate not irreconcilable with such forecasts;
> c) An identification and analysis of possible alternative sources of energy, both indigenous and imported, the cost involved and their optimisation
> d) Policy recommendations bearing on national energy supply and consumption" (Department of Planning Annual Report 1973:5).

The programme outlined above was limited to the context of the Department of Planning; what was meant by an 'energy programme' was in fact an energy planning process which would be able to provide a context for energy-related decision-making processes by executive planning bodies.

The occurrence of the energy crisis, from October onwards, led to a dramatic escalation of interest from government in energy policy, and a series of institutional innovations. Not only had the oil crisis threatened South Africa's security of supply, and increased the cost of oil significantly, but it had also (through a massive price increase in crude oil) rendered a potential large-scale synthetic fuels programme an economically realistic option, thus increasing the need for the development of an energy-based decision-making framework.

The first response was to extend the PAC in early 1974 by the appointment of Dr A. Roux, head of the nuclear establishment, and an official from the Department of Industries responsible for oil

policy, as well as the Managing Director of Sasol (Department of Planning Annual Report 1974:3). The tiny energy section of the Department was expanded to a Subdivision in 1974, and a Division by 1976 (Department of Planning Annual Reports 1972-6); by 1979, the Department of Planning was renamed the Department of Planning and Energy, as energy policy was prioritised both within and outside the Department. The energy section also liaised with a set of other agencies which were sympathetic to the energy policy project, including other planning agencies and the Minerals Bureau, where Van Rensburg became the Deputy Director.

In April 1974, the Prime Minister established a dedicated Energy Policy Committee, as well as a corresponding Cabinet Committee (Department of Planning Annual Report 1974:7), the former chaired by the Secretary of the Department of Planning, and the latter by the Minister of Planning; Kotzé, the chief energy bureaucrat, acted as the EPC's secretary. The EPC consisted of the Secretaries of the Departments of Commerce, Industries, Mines, Finance, Planning and Foreign Affairs, as well as the heads of Sasol, Escom, the Atomic Energy Board, and the South African Railways, and the Economic Advisor to the Prime Minister, notably excluding any participation from the private sector, which dominated the coal and oil industries. The EPC was thus *not* a 'stakeholder forum', but an attempt to co-ordinate an inner circle of powerful and relatively autonomous state agencies; the political elite and line departments had their own well-developed networks with both the oil and coal industries. The energy section of the Department of Planning acted as a Secretariat to the EPC. The operating procedure of the EPC was via subcommittees or working groups, which would be appointed to deal with specific issues, with support from the Secretariat. The conclusions of the subcommittee would be approved by the EPC, and then presented to the corresponding Cabinet Committee, which would raise the issues with the Cabinet (Interview with D Kotzé).

In terms of membership, the EPC was almost a subset[5] of the PAC, and their different spheres of influence overlapped significantly. While the EPC focused primarily on strategic energy issues (coal, liquid fuels), the PAC considered these in a broader development context, and there were energy issues which the PAC dealt with which were not considered by the EPC, such as spatial planning issues related to the electricity system, since Escom had been integrated into regional planning processes since after the second world war. The PAC also established a "Subsidiary Committee for Trends in Energy Consumption" (Department of Planning Annual Report 1975:7), which commissioned reports such as the 1977 'Outlook for Energy in South Africa' (Department of Planning 1977), and the 3-volume 'Energy Utilisation in South Africa' (Department of Planning 1978) undertaken by the Energy Research Institute at UCT.

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[5] With the exception of the Secretaries of Foreign Affairs and Commerce, who were only on the PAC.

Within this organisational and jurisdictional complexity, however, the basic parameters of energy policy activities were set by a contest between three different groups, which continued from the early 1970s until the 1990s. The first of these, which can be characterised as 'energy policy advocates', comprised a small collection of bureaucrats and intellectuals, and their supporters amongst senior bureaucrats, who were ardent proponents of the development of 'an integrated and comprehensive energy programme'; the bureaucrats generally espoused an institutional culture based in some form of planning, and the intellectuals were usually situated in a university context. The second group consisted of bureaucrats directly involved in regulation of, or policy activity concerning, energy supply sectors, and the third consisted of actors in the energy sector, which included parastatals and other state agencies such as the nuclear establishment, as well as coal producers and oil companies. Broadly, the aim of the first group was to develop a strongly-integrated energy policy and planning process, which would to a large extent incorporate the decision-making processes of the other two groups, whereas the aims of the second and third groups was to influence or evade this process. Organisationally, the first group comprised the energy policy section of the Department of Planning, which was mainly concerned with developing the 1973 planning-based programme outlined above, which was pursued in both the EPC and the PAC, whereas the second and third groups were structured into two groups: the second group, and the state agencies in the third group, were represented on the EPC and the PAC, whereas the oil and coal industries were not, but had other direct ties to the political and economic elite.

Thus, in the 1970s, policy activities were neatly divided between the development of a comprehensive energy planning process (Department of Planning) and sectoral policy and regulatory activities, which were pursued elsewhere, and partially negotiated in the EPC. Below, the first activity will be discussed, before a detailed analysis of the nature and scope of decision-making in the EPC. The 'energy policy advocates', including the Secretary of the Department of Planning, were heartened by the reaction to the 1973 crisis, for two reasons: first, in the wake of the crisis,

> "..the call for more comprehensive energy planning and co-ordination became stronger, which is a sign that the importance of this aspect of the planning task is now realised in all quarters.." (Department of Planning Annual Report 1975:5);

and second, political pressure created by the crisis increased inter-agency co-operation in the energy policy domain (see below). However, the capacity of the energy section to develop an 'energy programme' as referred to above was severely hampered by a shortage of organisational capacity, in terms of both skills and staff. The solution to this problem was to form close associations with a network of external research institutions, which began through an association

with two university-based energy research institutes, and was extended into a more complex network through first the CSIR and then the NEC in the 1980s and 1990s (see below).

The first of these was the Energy Utilisation Unit (EUU) formed in 1973 in the Department of Mechanical Engineering at the University of Cape Town by Professor R Dutkiewicz, who had previously started a research department at Escom. The EUU became the Energy Research Institute in 1976, and was given its first large contract by the Department of Planning's energy section in 1973, to undertake a survey of energy demand[6] in South Africa (Hofmänner 2002:190-192; Interview with D Kotzé); further work included extensive demand studies and other policy-related work, including a large programme on alternative liquid fuels during the 1970s and1980s.

The second research unit was initiated by the Department of Planning itself, in collaboration with BP, who funded the establishment of a Chair in Energy Studies at the Rand Afrikaans University in Pretoria in 1975. The Chair was situated in a new Institute for Energy Studies, the aim of which was both to develop skilled personnel to undertake energy policy analysis, and to provide support to the energy policy process. The Institute was formally associated with the PAC and its subsidiary committee, and was intended to provide additional support to the PAC. Both Institutes were governed by 'advisory boards', which consisted of key representatives from the energy sector, and much of the Institutes' funding was also derived from the energy sector via consulting work or contract research. Most key organisations in the energy policy sphere were, in addition, members or associates of the Institutes. Both Institutes thus served not only as intellectual centres for the new energy policy project, but also as important networking points for the energy industry generally. The EUU/ERI held the first of a series of national South African conferences on energy policy in 1975, and the IES hosted numerous "closed conferences" on energy policy issues (Hofmänner 2002:220), which contributed to the building of an intellectual consensus amongst an increasingly closed energy policy community on the scope and direction of energy policy.

The kind of 'energy planning' undertaken in the 1970s was epitomised by the 1977 'Outlook for Energy in South Africa' (Department of Planning 1977), which was an assessment of future trends in the commercial energy economy, based on linear relationships between economic output and energy consumption, culminating with a resource-focused chapter on "The availability and adequacy of energy carriers" (Department of Planning 1977:93). The study is remarkable in that it is one of the first conceptually-integrated descriptions of the energy sector in South Africa, and follows almost exactly the model for paradigm 1 energy planning outlined in Chapter 2; as such it made no normative recommendations, but merely forecast demand. A

[6] This was a ground-breaking survey, and the first of its kind in South Africa, containing a detailed analysis of energy demand, on the basis of which it would have been possible to pursue paradigm 2 energy policies: published as Department of Planning (1978).

closer look at what is at first glance an intimidatingly comprehensive document reveals some strange lacunae; the electricity and coal sectors are well-covered and contain detailed projections for demand and production, but while there is an aggregated demand projection for 'transport fuels', both the refining and synthetic fuels reviews contain no projections. Instead, the section on refining contains the final paragraph:

> "For the future it is assumed, for the purposes of this study, that refinery capacity will always be sufficient to meet domestic demand.." (Department of Planning 1977:62),

which eliminates one of the basic functions of energy policy, security of supply, especially considering that total liquid fuels manufacturing capacity was about to become a central focus of South African energy policy via the Sasol projects. This was closely connected with institutional limitations: whereas energy-related information on coal reserves and use was by 1977 the focus of a highly co-ordinated and well-resourced process linked directly to the energy section in the Department of Planning, and electricity planning was carried out by a single agency in Escom, planning for liquid fuels manufacturing expansion was carried out by the (privately-owned) oil industry, and was not accessible to the energy section in the same way (both because of lack of access to the oil industry and lack of capacity); thus, apart from affecting actual policy processes, the structure of energy sector institutions also affected the structure of available information. This effect would intensify dramatically after 1979, when access to any information on the liquid fuels industry was barred.

The central question is how this analytical capacity was integrated with concrete policy and planning processes, which existed independently in different energy supply sectors.

There were two types of limits on what defined the EPC's decision-making scope. The first was defined by the institutional limitations of the Department of Planning, which was not the implementing agency for energy policy decisions, as outlined neatly in an interview by the secretary of the EPC in the 1970s:

> "..although the government established the Energy Policy Committee.. ..that committee, or the Department of Planning never really had the authority to implement energy decisions on the ground. It never really dealt with the day to day running of the energy industries. For instance, Eskom and the responsible Secretary, would decide when they wanted to build a new power station [or alter the electricity price, etc].. ..those issues were never dealt with in the EPC. Similarly, the Department of Commerce ran the oil industry.. ..everything concerning the day-to-day running of the oil companies was done between the oil companies and the responsible Secretary.. ..One may ask, what was the function of the EPC? In practice, it was just an advisory body, where all the heads of the various energy responsibilities could come together and at least have some sort of contact, and over the years the issues that were discussed there were mainly of a broad, umbrella nature; never the day to day operational

issues. It's impossible to separate them, and in practice it did lead to a situation where there was tension between the chair of the EPC (and his responsible Minister), and the Heads of Departments, the Secretaries who were responsible for the day-to-day running of these, such as the oil industry. Sometimes for instance, issues would be referred to the chairman of the EPC by outside interests, say an oil company who wanted to import refined product, but the Department of Commerce would say 'but it's not your business, it's not your brief – you must leave that to us' – so quite often there was tension there, and that tension in fact existed for as long as I can remember until it sort of dissipated with the institution of the DMEA, because then the responsible units were centralised in the DMEA" (Interview with D Kotzé).

The second was in overcoming the autonomy of existing policy domains in the energy sector. The success with which this was done depended on a mixture of institutional and political factors (which will be elaborated on below), and in many instances hinged on the existence of a 'threat':

"..each responsible office did their own thing. ..Commerce looked after oil, Mines looked after Mines and so forth, and they guarded their areas very jealously; even though it was all government business, it did not prevent these guys from getting very excited if they felt that another Department was encroaching on their area; but ultimately when there was a threat, then they very quickly organised themselves and [we] got that co-operation" (Interview with D Kotzé).

The amount of co-operation varied significantly across energy supply sectors, and was a combination of the broad political context (the political perception of 'crises'), the operation of the policy networks of individual energy supply sectors, institutional factors and the limits of the particular conceptual approach to energy policy shared by policy-makers during the 1970s. These can be better demonstrated through a more detailed examination of which key energy policy-related decisions the EPC involved itself in from 1974 until 1979 in the four energy supply areas discussed in Chapters 3 to 6 (coal, electricity, nuclear and liquid fuels). These were determined by a combination of two factors: first, certain issues were identified as 'energy policy' issues by the executive (mostly through the Cabinet) on which the EPC should pronounce, and second, members of the EPC promoted and excluded issues themselves, with varying succes.

The EPC's involvement in key coal policy decisions began when the first tranche of export permits was referred to the EPC for approval in late 1974 (Department of Planning Annual Report 1974:7), with accompanying conditions regarding local supply and extraction rates. The remaining tranches (1976, 1979, 1982/3), including the two phases of the fourth tranche, were also referred to the EPC after the creation of the DMEA (Department of Planning Annual Report 1977, Department of Mineral and Energy Affairs Annual Reports 1980-83). The Petrick Report, which was completed in 1975, was referred to the EPC by the Minister of Mines before being

tabled in parliament; the EPC was asked to recommend policy changes which might flow from it (Financial Mail 16/5/1975, Financial Mail 13/6/1975). The EPC then established a working group to analyse the Report consisting of members of the EPC as well as others co-opted from the Minerals Bureau, Sasol, Escom, Iscor, the Office of the Government Mining Engineer and the Geological Survey (Department of Planning Annual Report 1976:7), but notably lacking the Department of Commerce, the traditional coal policy agency; the Working Group's report stressed, amongst other issues, the "..importance of the centralised co-ordination of government powers" in developing an integrated coal policy (Department of Planning Annual Report 1977:31). By comparison with the old coal policy paradigm, which really only involved one state agency, the Department of Commerce, the new coal paradigm did indeed involve the co-ordination of a number of state agencies, including new agencies such as the Minerals Bureau, which Department of Planning personnel were instrumental in establishing, and to which they had been seconded; thus the Department of Planning had been instrumental in creating the new policy context, and the EPC (and the PAC before this) played key roles in this co-ordination process. Moreover, the new coal policy was eagerly supported by a key constituency, the coal producers. Planning processes, which began with a new paradigm for assessing the resource base pioneered by the CAB report and elaborated by the Petrick Commission, were based in the new Minerals Bureau, and formed an important part of coal policy processes. Thus, in terms of coal policy, the EPC played a central role, and was involved in key decision-making processes in the 1970s and early 1980s.

The involvement of the EPC in liquid fuels policy was significantly more limited, and focused on the synthetic fuels programme decisions; the EPC played a key role in the decision to build Sasol 2, and the later decision in 1979 to build Sasol 3. In the case of the Sasol decisions, both were taken by specially established subcommittees, based on detailed proposals prepared by Sasol. In the case of Sasol 2, the EPC had its first meeting in August 1974, and the decision process took place in October and November (Interview with D Kotzé); the energy section of the Department of Planning had been in existence just over a year; thus the subcommittee was heavily dependent on Sasol for feasibility studies and analysis. The Sasol 3 decision was made within a similar time period in early 1979. Both decisions were made by the EPC in the context of the new coal policy framework.

By contrast, in other areas of liquid fuels policy the EPC was less involved, or not at all: it had a small, programmatic policy role in the fuel conservation programme, but major policy decisions were the domain of the Department of Commerce, which was also resistant to any involvement of the EPC in regulatory issues. The EPC was also not involved in any way in policy issues relating to crude oil procurement and strategic storage (such as the 1979 decision to centralise

crude oil procurement in the SFF); these were limited to Sasol, the SFF, and a small section of the Cabinet. Another area which the EPC was not involved in at all, and was not well-co-ordinated within the state until the 1980s, was expansion planning in the liquid fuels sector. While the closely co-ordinated oil industry made refinery expansion decisions themselves based on demand models, plans to add refinery capacity (either through extension or new plants) was subject to licensing by the Department of Industries, and expansions after 1973 were undertaken in 1975, 1976, 1977 and 1978 (see Chapter 6). While the oil companies controlled the liquid fuels manufacturing industry, this system functioned relatively well, but the Sasol 2 decision, coupled with an unpredictable demand pattern after the oil crisis, required more co-ordinated investment in what was both a strategic industry and an industry where market forces played a very limited role, and almost no allocative[7] role after 1973.

The reasons for the limited role of the EPC was that neither the development of the oil security strategy nor the oil crisis had resulted in a change in policy paradigm; on the contrary, the existing policy framework was carefully augmented to ensure the continued co-operation of the oil industry. Control of key areas, specifically regulation, was maintained in the same institutions, and there was no significant shift in the membership or influence of the policy community; to this end, Sasol was carefully kept out of the retail market by the government, to maintain it as the exclusive province of the oil majors. Thus, while the EPC did not decide on any other liquid fuels policy issues, which were the preserve of the Department of Commerce (regulation), the Department of Industry (refining), the oil industry, Sasol, the IDC, and the Minister of Economic Affairs, the Sasol decisions were conceived of at Cabinet level as 'energy policy' issues on account of the coal nexus. The institutional outcome of this distinction was that whereas the Department of Planning and its associated Committees and Councils performed a co-ordinating function in the new coal policy regime, there was no similar co-ordinating function in the enlarged liquid fuels policy landscape of the 1970s, which had serious shortcomings[8], and was one of the factors behind the centralisation of liquid fuels regulatory functions in one Department after 1980. Thus, in terms of liquid fuels policy, the EPC's role was limited, and delineated by the nexus between coal and the synthetic fuels industry; ventures into more general liquid fuels policy issues were successfully discouraged by hostility from other agencies.

The electricity sector was mostly impervious to the EPC: the distribution industry was regarded in both the 1970s and the 1980s by energy bureaucrats (see Chapter 4) as beyond the scope of

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[7] Investments in Sasol 2 and 3 were made despite the market, rather than in response to it, and refinery upgrades after 1973 were made on the basis of previous demand growth trends, which did not extend into the future; also, although the regulatory system was designed to mimic a market price, oil security strategy premiums caused it to diverge significantly from a realistic import parity price, which also explains the overinvestment in refinery capacity in the 1970s, since demand was dampened at the higher prices of liquid fuels.

[8] Related to planning and co-ordination of productive capacity (see above) and in the 1970s, the co-ordination of capital expenditure and borrowing with other strategic energy-sector projects.

electricity or energy policy[9] since the decision in the 1960s to centralise generation in Escom, which was also a reflection of the predominant energy policy paradigm; thus, the ambition of energy planners to integrate electricity policy into a more general energy policy context was limited to Escom. In terms of coal policy, Escom collaborated closely with strategic initiatives to increase extraction rates and boost investment in new mining capacity, which was partly required for (and financed by) Escom's massive expansion programme, which gave coal policy agencies significant leverage on coal producers.

There were three key areas in which major electricity policy decisions were arrived at in the 1970s, without reference to the EPC: the first was Escom's expansion programme, and its planning process in general; the second concerned the nuclear power programme; and the third concerned the dramatic price increases in the late 1970s, and the associated decision to expand the use of the CDF (see Chapter 4). Major expansion programmes were announced in 1974 and 1979 with very significant implications for coal resources and capital requirements (which was the rationale for the EPC considering the Sasol decisions), which were an outcome of Escom's planning process alone. The 1977 Board of Trade inquiry into electricity tariffs pointed out that the Department of Industries lacked any policy capacity to make assessments concerning critical electricity policy decisions (see Chapter 4), and, while there was limited co-operation between Escom and state industrial development agencies in providing electricity supply to new industrial projects, Escom's interaction with other state agencies was only at the highest level:

> "Escom and the responsible Secretary would decide when they wanted to build a new power station, or when they wanted to change the status of Escom from one kind of government organisation to the other, or when they wanted to increase the tariffs, the prices of electricity; that kind of thing. Those issues were never dealt with in the Energy Policy Committee" (Interview with D Kotzé).

The same applied to the major decision to start a nuclear power programme in the form of the decision to build the Koeberg power plant. Although the decision to build Koeberg was taken in principle in 1974, before the EPC was functioning effectively, subsequent decisions (including the final contract) leading up the final process were not dealt with by the EPC at all:

> "I cannot remember that we ever discussed this in the Energy Policy Committee – there again is an excellent example of where a decision was taken in the top echelons of government – it was not an energy decision – it never came across my desk.." (Interview with D Kotzé).

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[9] For most of the 1970s and 1980s, electricity distribution was simply regarded as the preserve of local authorities, and did not require policy intervention, except for two (unsuccessful) proposals by central government to introduce electricity conservation measures via local authorities in the late 1970s and late 1980s.

The extent to which electricity was not considered to be an energy policy matter by the Cabinet in the 1970s is indicated by the response to the price hikes from 1975-8 by the state, which were linked to coal price increases and, more significantly, Escom's need to 'self-finance' after 1976. The BTI, which was appointed to investigate, did not place the problem in an energy policy context, by contrast with the later De Villiers Commission and the earlier Petrick Commission. The decision by the Minister of Economic Affairs to accede to Escom's request to significantly increase CDF contributions, which probably had the largest economic impact on the South African energy system in the 1970s, was not considered by the EPC.

There were two significant steps that the EPC did take in relation to the price hikes. The first was a programme of evaluating, and attempting to place in an overall policy context, the various investment programmes underway in the energy sector from 1975 onwards, as recorded in the 1975 Annual Report of the Department of Planning:

> "..recently it has again become evident that heavy demands would be made on South Africa's capital resources by developments within the energy industry. In this connection mention may be made of the expansion of the coal production capacity and the erection of plants for the conversion of coal into liquid fuels and gas, for the generation of electricity from coal and uranium, and for the enrichment of uranium. During the past year the Committee and its Secretariat have tried to evaluate the implications of these development and will continue to do so in the future." (Department of Planning Annual Report 1975:7).

In 1977, Escom was forced by the government to cut back its expansion programme, as a result of growing alarm over increasing prices (during a recession in 1977) and domination of the scarce foreign exchange resources after 1976; the initiative for this probably[10] emerged from the Department of Planning's co-ordinating structures, either through the PAC or the EPC. The second step consisted of the initiation by the EPC of investigations into the feasibility of an electricity conservation programme, in collaboration with, and at the request of, the Department of Industries, which consisted of the establishment of a working committee comprising "consumers, electricity suppliers and the public sector" (Department of Planning Annual Report 1978:73). The committee met twice and submitted a report to the EPC in 1978, but the initiative did not continue. It seems that local authorities expressed interest in the programme, but Escom did not (Department of Planning Annual Report 1978:73).

Several factors combined to marginalise the EPC's role in policymaking in one of the three core supply industries in the South African energy system. Generally, electricity policy in the 1970s

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[10] The fact that a large power station order was cancelled is well-established but the provenance for this decision is not: it seems most likely that it came from a planning agency or committee close to the Prime Minister, who would have had to understand and support the move. There is a passing reference in the 1976 Department of Planning Annual Report to the EPC being tasked with evaluating the capital priorities of various energy sector projects, which was the year that foreign borrowing became very difficult.

was not viewed by the political elite as within the energy policy domain, except through the coal nexus, but it was viewed as such by energy planners, who were frustrated by this attitude. In addition to this, no state agency outside Escom had the capacity to develop electricity policy alternatives; the electricity system was developing on the same trajectory which it had for the last few decades, and its development was overseen almost solely by Escom. Unlike the liquid fuels industry, the peculiar structure of the South African energy system meant that the electricity system was not directly affected by the oil crisis, nor was it threatened by an embargo; thus, unlike in other energy supply industries, the oil crisis did not result either in any external threat to the policy community, or in political pressure to co-ordinate decision-making in a broader energy policy context.

The nuclear establishment was the most hermetic, as a result of a number of peculiar features, of which the main one was that it did not produce anything tangible until the late 1970s, which meant that it was not involved in any kind of economic relationship with any other stakeholder other than the state, which provided all of its funding[11]. Until the development of the nuclear fuel cycle, which only began production in the mid-1980s, this relationship was entirely one-sided. The institutional nature of the nuclear establishment was that it had been shrouded in complete secrecy since its inception; this secrecy was intensified from the late 1960s with the development of nuclear technology (and weapons). As a result, although the nuclear establishment was overseen by the Department of Mines, and later the Department of Mineral and Energy Affairs, neither Department had any role in making nuclear policy or even legislation until the late 1990s, and lacked entirely the capacity to do so. One of the key rationalisations of the nuclear programme was that it would succeed coal as South Africa's primary energy source, which was given a new spin by both the apparent promise of the South African enrichment technology, and the energy security context. The vice-president of the AEB, Dr Louw Alberts, commented in 1973 (a month after the start of the oil crisis) that by the end of the century, electricity in South Africa would "to a large extent" be sourced from nuclear power plants, while coal would mainly be used to produce liquid fuels (quoted in Financial Mail 2/11/1973). This was not ultimately a strategy pursued by government; the nuclear establishment succeeded in maintaining state support (with the limited goal of producing Koeberg's fuel), but not in establishing either a large-scale nuclear power programme, or a commercially-scaled nuclear-industrial complex.

The three key nuclear-related decisions of the 1970s, the Koeberg decision, a series of decisions on the construction of a commercial-scale enrichment plant, and the series of decisions regarding fuel for Koeberg, which culminated in the decision in 1979 to build the three semi-commercial

[11] The nuclear establishment did not even produce uranium, the production of which initiated the state's involvement in nuclear affairs, since this was produced and marketed entirely by private sector mining companies.

fuel cycle plants, were not considered by the EPC, but in secret by a smaller group consisting of the Prime Minister, a handful of Cabinet ministers and the leadership of Escom and the nuclear establishment, although the secretariat of the EPC had done significant work on nuclear power. The limitations of the role of the EPC, combined with the lack of capacity in the energy section of the Department of Planning, led to the frustration of the goal of formulating a 'comprehensive' energy policy framework; however, the core parameters were fairly clearly-defined; these were based on a variant of paradigm 1, involving two key components: energy security, and a natural resource-based approach to energy policy, based primarily on coal. Conservation programmes were viewed as emergency measures only, and demand-side measures were excluded: a 1979 interview with Chris Heunis, the Minister of Economic Affairs, is revealing, in that the Minister specifically ruled out the two key demand-side measures which could have cut fuel use significantly:

> "Question: Why has the motor industry not been compelled to incorporate more efficient engines in its vehicles, as has happened in certain other countries?
> Heunis: We prefer persuasion, rather than dictation.
> Question: Why has not special help been given to expand the public transport system?
> Heunis: If our problem becomes more serious, we shall have to take another look at the quality and availability of public transport in the main metropolitan areas. It is a matter of priorities and availability of capital" (quoted in Financial Mail 29/6/1979).

The assertion that the apartheid state "preferred persuasion" is remarkable not only because of its fundamentally coercive nature, but also because of the range of state controls imposed on the economy at the time, as well as draconian measures such as the 1979 Petroleum Products Amendment Act. The reflections on a shortage of capital as regards public transport are equally at odds with the massive capital expenditure programmes then underway in the energy sector. Neither were demand-side policies considered in other areas; the energy intensity of the South African economy in fact *increased* by one third[12] from 1970 to 1985, partly on account of energy sector projects such as Sasol 2 and 3, and the uranium enrichment plant. By the end of the 1970s, the business press reported that

> "..SA is riding an energy boom the magnitude and implications of which are comprehended by few.. ..the country seems to have acquired a Texas complex, currently having in hand the development of the world's biggest coal mine, biggest coal-fired power station and biggest coal liquefaction plant.. ..within the Republic, the energy industry is marked by massive projects and escalating pioneering activity.." (Financial Mail 29/6/1979).

At the time, energy megaprojects under development included Sasol 2 and 3, several huge coal mines, a nuclear power plant, several coal-fired power plants, and three nuclear fuel cycle plants,

[12] Measured as Joules of primary energy per real rand of GDP (Department of Mineral and Energy Affairs 1995:64)

all of which, except for the coal mines, were being developed by state agencies; even the coal mines were largely financed through Escom. However, as detailed above, the role of energy policy institutions per se in co-ordinating this immense development was limited. The 1979 oil crisis, which, unlike the first oil crisis, created a real oil supply crisis, heightened the strategic imperative for co-ordination in developing and implementing liquid fuels policy, and highlighted the weaknesses of the existing institutional arrangements, which primarily involved a lack of co-ordination. The next phase in the development of South African energy policy attempted to solve these problems by co-ordinating both state agencies (through bureaucratic centralisation), and the private sector, through new energy policy institutions.

3) 1980 to 1986

The next phase in the development of South African energy policy and institutions was precipitated by two factors: the 1979 oil crisis, which intensified the strategic importance of energy policy, and a change of national political leadership (in 1978), which resulted in a reorganisation of the civil service, and a significant shift in economic policy within the state, combined with a rapprochement with the private sector. In the reorganisation, energy functions were centralised to a far greater extent; in practical terms, this primarily involved the centralisation of coal and liquid fuels regulatory functions, as well as a restructuring of the oil security strategy's key processes in a new holding company based in the new department, the Central Energy Fund (CEF) in 1985.

The crisis which was engendered by the 1979 oil crisis was repeated in local terms in 1985 by a precipitous fall in the exchange rate, which produced a similar rise in the rand price of oil to the 1979 crisis, which coincided with a general economic slowdown throughout the 1980s: thus, there was significant political support for restructuring energy policy institutions, which were mainly understood within a strategic context.

The Botha civil service reorganisation

The bureaucratic reorganisation of the state under Botha in the early 1980s (Swilling 1988:3-4, O'Meara 1996:278-290) had numerous implications for energy policy institutions. The resignation of B. J. Vorster[13] as Prime Minister, and the election by the National Party of P.W. Botha in his place, represented a shift from an old-style 'Grand Apartheid' state ideology characterised by significant bureaucratic control of a large percentage of the economy, to a reformist and technocratic state, characterised by a move to a 'free enterprise' ideology

[13] Vorster resigned in the so-called 'info scandal', in which state agencies were found to have used government resources to clandestinely fund various pro-apartheid propaganda operations, in South Africa and abroad. The leaking of key aspects of the scandal was attributed to Military Intelligence, allegedly at the behest of Botha, who was Minister of Defence at the time.

characterised by deregulation and privatisation, as well as an increasing militarization of the state. As part of this shift, state institutions were restructured over a five-year period from 1978 to 1983. The policy framework for this reorganisation was outlined in a 'White Paper on the Rationalisation of the Public Service and Related Institutions' (1980 Public Service White Paper), resulting from a Public Service Commission review ordered by Botha in 1979.

The reason for the rationalisation was the unwieldy structure of the civil service, a "ramshackle affair", in which "..bureaucratic incoherence was a serious problem" (Swilling 1988:3), and central co-ordination of policy and strategy was weak; furthermore the apartheid state was facing a growing political crisis in the form of internal resistance and insurrection to apartheid, coupled with increasing international pressure and isolation. Botha constructed a new power bloc by an ingenious combination of three elements to counteract this crisis: a reformist approach to apartheid, an alliance with private capital, partly achieved by a rapprochement between 'Afrikaner' and 'English' capital and the success of the former in the 1960s and 1970s, and a militarist approach to social and political stability (Swilling 1988:5). The synthesis was based on a complex reform strategy based on the work of US political scientist Samuel Huntingdon, who advocated a transition to democracy via a period of 'autocratic reform', coupled by an attempt to cast 'radical' opposition to apartheid as a 'total onslaught' masterminded by Moscow, which was calculated to gain (anti-communist/anti-socialist) support from the business community, discredit anti-apartheid movements, and garner support from the USA (Reagan) and the UK (Thatcher). Thus, the motivation for the rationalisation of the civil service was to gear the state to carry out a 'total strategy', by rationalising its key functions and improving strategic and policy co-ordination in the light of the main threats facing it, which amongst other things included

> "..onslaughts on the Republic, which call for new services and government measures as well as for the adjustment of priorities.. [and] ..problems arising from the proliferation of government institutions, with resulting problems of co-ordination and the under-utilisation of manpower" (1980 Public Service White Paper:2).

The White Paper specifically cited the (1979) energy crisis as a cause of a "shift in emphasis" in national priorities (1980 Public Service White Paper:2), which was based on the prioritisation of three major goals for the executive: energy security; mitigation of the impact of energy projects and oil imports on foreign exchange and capital requirements, and the resistance of nuclear and oil sanctions, for both practical and symbolic-propaganda purposes.

The specific changes which affected energy policy-related institutions occurred at several levels. The first, and most immediately significant, was a restructuring of state departments, which were reduced significantly in number (from 39 to 22) and restructured according to operational and strategic priorities: included in this process was the creation of a consolidated Department of

Mineral and Energy Affairs, which will be described in more detail below. The second significant change was a change in the state's planning and policy co-ordinating system. The Department of Planning and Energy was abolished, and the Department of the Prime Minister converted to a more centralised Office of the Prime Minister, which included four streamlined planning functions, before transferring them to the newly-created Department of Constitutional Affairs and Planning in 1982, which became centrally important in devising and implementing reformist apartheid policies in the 1980s (Swilling 1988:6). The Cabinet system was restructured, and the large number of Cabinet committees (including the Cabinet committee for energy policy) replaced by only four, including a Cabinet Committee for National Security, or the State Security Council, and a Cabinet Committee for Economic Affairs, which dealt with energy policy issues. The State Security Council under Botha served a crucial co-ordinating function in the 1980s, and extended its reach through a 'National Security Management System' to all levels of government, serving as a 'state-within-a-state', and included 13 'inter-departmental committees', including a 'national supplies and resources' committee, and a 'telecommunications and electrical power supply' committee (Swilling 1988: 5-8; 1980 Public Service White Paper:4-8).

An additional shift of some significance was the restructuring and 'commercialisation' process applied to parastatals in the 1980s, which were 'corporatised'. In terms of energy sector-related institutions, Sasol was largely privatised in the early 1980s, the South African Railways (and affiliated transport assets, including harbours, the national airline, and the petroleum pipelines network) was converted into Transnet, the Atomic Energy Board into the Atomic Energy Corporation, Escom into Eskom, and the system of quasi-state organisations and funds comprising the state's oil security strategy placed into an umbrella holding company, CEF Pty (Ltd). In almost all cases, this was achieved by a cadre of high profile and politically well-connected Afrikaner businesspeople from both the private sector and the IDC, handpicked and imported into parastatals by P.W. Botha.

The creation and structure of the Department of Mineral and Energy Affairs

In 1980, the Public Service Commission created, amongst other new and consolidated departments, a new Department of Mineral and Energy Affairs, which contained an Energy Branch, which was the second significant energy policy-related institutional innovation of the apartheid state. The head of the Energy Branch had the rank of Chief Director, two ranks below the head of the Department, and was thus a mid-ranking official. The DMEA Annual Report observed that

> "..for the first time in the history of the public administrative system in South Africa all energy related functions are not only housed in one and the same department, but are housed in a department which is responsible for both the energy and the mineral policy in the country.." (Department of Mineral and Energy Affairs Annual Report 1980:71).

The immediate institutional antecedent for the Energy Branch was not the Department of Planning's energy section, but the Minerals Bureau, which the newly-appointed head of the Energy Branch, Dirk Neethling, a geologist by training, had founded in 1975. The Minerals Bureau had been founded for a similar purpose (the development of a strategic approach to minerals development policy), and had the same institutional origins as the energy function in the Department of Planning (natural resources development policy). The Minerals Bureau was also created from the merging of a number of functions in diverse state agencies, and also aspired (quite successfully) to develop a policy consensus based on research, involving considerable involvement from the private sector (which owned most of the minerals industry). Neethling's appointment was also indicative of the common perception of energy policy at the time, which was based largely on coal, one of the Minerals Bureau's main areas of activity, as was the location of the new Branch in the Department of Mines rather than the Department of Trade and Industry. As the DMEA's first Annual Report observed:

> "..since coal is South Africa's most important source of energy, for the present as well as for the foreseeable future, the combination of the energy and minerals functions is of great importance for effective determination of [energy] policy by the Government on a co-ordinated basis.." (Department of Mineral and Energy Affairs Annual Report 1980:71).

What characterised Neethling's tenure as the chief state energy bureaucrat (from 1980 to 1991) was an ongoing technocratic concern to develop a *programmatic* energy policy, which was consonant with his work in the Minerals Bureau (Interview with D Neethling), and also with the Public Service Commission's mandate in 1980 to:

> "(a) Determine present and future energy demands; (b) Determine energy sources and potential sources of energy; (c) Arrange for the satisfaction of the country's energy requirements, and (d) initiate energy conservation measures" (Department of Mineral and Energy Affairs Annual Report 1980:71).

While the 1970s functions of the energy policy bureaucracy were limited to promoting co-ordination and providing a policy context (through 'energy planning'), the Energy Branch was expected to actually "..arrange for the satisfaction of the country's energy requirements..", which required not only a centralised planning capacity, but also a previously-fragmented capacity to execute plans.

To this end, the creation of the Energy Branch required significant institutional restructuring, which was uneven in the degree of centralisation of energy sector-related administrative,

planning and policy-making functions. Of these existing functions in government, the core of the new Branch was comprised of two clusters: liquid fuels and coal industry policy and regulatory functions, which were transferred from the Departments of Commerce and Industry, and the energy section from the Department of Planning; the Minerals Bureau's coal resource evaluation functions remained *in situ*. The other cluster of functions pertaining to the oil security strategy which were administered by the IDC and Sasol, including the SFF and the other Funds, the strategic stocks process and crude procurement, were progressively restructured during the early 1980s. After a series of disastrous and highly-publicised frauds, oil trades were approved through the Energy Branch by the relevant Minister, and the privatisation of Sasol led to its withdrawal from the management of the SFF and related Funds. These were managed by the IDC until the creation of a holding company, CEF Pty (Ltd) in 1985, which also housed Soekor (previously based in the Department of Mines). There was, from the early 1980s, a significant degree of interaction between the regulatory arm of the Energy Branch and CEF concerning synthetic fuels, regulation and oil trading: thus by the mid-1980s, the three poles of the liquid fuels policy system in the apartheid state – market and trade regulation, manufacturing regulation, and the IDC/Sasol-based planning and implementation functions (in the synthetic fuels industry and strategic stocks programme) – had reached an unprecedented level of co-ordination. The first two functions were incorporated directly into the Energy Branch, whereas CEF was attached to the DMEA as an 'associated institution': information on operational aspects of the strategic stocks and crude procurement programmes were kept within CEF, and details concerning liquid fuels (and crude) consumption and trade were confined to a tiny circle of officials in CEF, the DMEA and the oil industry.

However, integration of the other two areas of policy activity in the energy sector were not significant: although oversight of Escom was transferred to the Energy Branch from the Department of Industries, electricity policy-making and planning resided entirely in Escom, and the Energy Branch did not develop any notable electricity policy capacity. The other aspect of energy policy, the ECB, which had been augmented (by two board members and half a staff member) following the BTI investigation, was also transferred to the Energy Branch, which provided various forms of support; however, the regulatory dispensation relegated the ECB to a minor role, and Escom's status and elite connections rendered the Energy Branch ineffectual in influencing electricity policy. The Energy Branch in any case did not develop any significant electricity policy capacity. Nuclear policy was even more removed from the Energy Branch's jurisdiction: although the organisation continued to report to the executive through the DMEA

(previously the Department of Mines), the Energy Branch was not given oversight of either the AEC or the relevant legislation, and scrupulously avoided any trespass into nuclear policy[14].

The Energy Branch was divided into two sections: an 'energy supply' division, consisting of the above functions divided into two further sections ('energy acquisition', including crude procurement oversight, coal production and the liquid fuels manufacturing industry, and 'energy distribution', which included coal and liquid fuels market regulation); and an 'energy planning' division. The latter division's function was to provide an overview of the energy economy as a basis for policy development; in relation to this, the division had two other functions. The first was inherited from the Department of Planning, from which the division was transferred: the division continued to serve as a secretariat for the EPC, which continued to endorse key energy policy decisions until its replacement by the NEC in 1987. The composition of the EPC changed significantly in 1982, with inclusion of 'private sector' representatives (Department of Mineral and Energy Affairs Annual Report 1982:62). This was again not an attempt to transform the EPC into an energy sector-wide stakeholder forum, but merely a response to the privatisation of Sasol, which formed an important part of the state's energy establishment, and was reincluded on that basis. Another notable addition since the 1970s was the inclusion of the President of the CSIR, who was appointed on account of the second function of the planning division, which consisted of liaising and overseeing the National Programme for Energy Research (NPER) (based in the CSIR). The NPER was founded in 1978 as the Co-operative Energy Research Programme by the CSIR, and restructured in 1981 as the NPER, which was

> "..established to function.. ..as the non-nuclear research and development arm of the Department of Mineral and Energy Affairs" (Hofmänner 2002:80),

the aim of which was to co-ordinate technical energy sector-based research projects which were deemed to have significance for energy policy problems, since as the 1981 Annual Report correctly pointed out,

> "..government funding of energy research and development to date has largely been directed towards nuclear energy.." (Department of Mineral and Energy Affairs Annual Report 1981:61).

The NPER was managed by the National Committee for Energy Research (NCER), on which were represented the Energy Branch, the CSIR and several other government agencies, and funding for the programme was from 1982 channelled through the Energy Branch. The NPER had a staff of six, and commissioned research from various sources according to criteria set by the NCER.

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[14] A common adjective in DMEA and NEC Annual Reports is "non-nuclear" (e.g. non-nuclear energy research).

Apart from this formal structure, Neethling made efforts to develop his own network by having himself appointed to the boards or governing bodies of a number of energy sector-related institutions which were less well-integrated into the Energy Branch; these included the Electricity Control Board (Chairman from 1981), the Eskom Electricity Council (from 1985-1992), the SFF (Chairman, which included Chairman of the SOF, until 1985), and CEF (from 1985 on). Notably, Neethling was not appointed to any of the nuclear establishment's Boards. It is also notable that Neethling was appointed to Eskom's governing body only *after* the De Villiers Commission, when Eskom had temporarily lost some of its political influence, and the Commission had explicitly stressed the energy policy context of electricity policy.

The creation of this new edifice involved some significant changes in organisational culture: whereas energy policy activity per se had been centred on an energy planning function in the Department of Planning, the new leadership of the Energy Branch was drawn from a diverse institutional background. The original energy planning group was merged with others from a regulatory background (both in industry and in markets), and Neethling was from a third background in the Minerals Bureau. The result within the Energy Branch was that energy planning, which was favoured by Neethling as the basis for a 'comprehensive' energy policy, was elevated in terms of developing overall policy frameworks, but marginalised in terms of developing operational policies in specific sectors. The bureaucratic context of the Energy Branch, the DMEA (the rest of which was dominated by an engineering-based mining organisational culture), tended to emphasise two aspects of energy policy development: the emphasis on coal (and other primary sources), and the emphasis on large-scale technology-based policy alternatives, rather than either market-related or demand-side policies.

Key Areas of Energy Policy from 1980 to 1986

These can be divided in several areas: the first of these consists of major supply-side initiatives, most of which were continued from the 1970s; the second consisted of conservation measures, which consistently formed one of the basic mandates of the Energy Branch; the third consisted of the planning division's activities, which included a range of research projects initiated through the NPER, and the development of an Energy Policy White Paper towards the end of the period, overseen by the EPC.

Major supply-sector policies consisted of initiatives in coal and liquid fuels, as well as less-successful attempts at intervention in electricity policy; the Energy Branch had no role in nuclear policy decision-making at all: although the fuel cycle decision, which set the nuclear establishment's activities and funding for the 1980s, was taken in 1979, there were a number of subsequent decisions, including the commitment to develop a new enrichment technology, to

which the Energy Branch was not party (see Chapter 5). Coal policy unfolded on a trajectory set in motion during the 1970s through a set of co-ordinated state agencies, which were collected in the DMEA in 1980; coal policies probably constituted the most advanced energy sector policies in terms of co-ordination and sophistication. After 1980, coal policy activity consisted of a co-ordinated process of assessing coal reserves, developing and implementing export programmes linked to an increasingly complex set of policy objectives, and regulating the domestic coal market. Major export allocations, in phases 4A and B of the programme, were considered and granted by the EPC from 1981 to 1983. The next significant policy decision was made during 1985 and 1986, when the Energy Branch, under pressure from industry and elsewhere, deregulated the domestic coal market. After this, since no further export tranches were granted (export regulation was lifted in 1991), the only remaining coal policy activity related to energy was the monitoring of coal reserves, carried out primarily by the Minerals Bureau (Department of Mineral and Energy Affairs Annual Reports 1980-1986). By the mid-1980s, the coal industry had undergone the transformation which the policy initiatives were designed to bring about: extraction technology was revolutionised, massive investments were made in new capacity, and infrastructure to supply the domestic market was well-developed. In addition to this, both an international coal glut and sanctions against South African coal (both from the mid-1980s to the beginning of the 1990s), combined with the slower pace of Escom's expansion programme, removed any domestic supply problems. Improved extraction rates, slower primary energy demand growth, slower growth in liquid fuels demand (lessening the potential for expansion of the synthetic fuels industry), and Escom's improved power plant technology[15] also improved reserve figures. These factors taken together gradually took coal off the energy policy agenda.

Activities in liquid fuels policy in this period consisted of two major initiatives, as well as the continuation of other oil security-related functions. The first consisted of significant innovations in the regulatory system, designed to accommodate the output of Sasol 2 and 3 in the existing liquid fuels market, which occurred in 1983 and 1984, and the second was the development of a general policy framework for the development of the synthetic fuels industry between 1980 and 1984, which was approved by the EPC, and which was based on two principles: the first was a threshold of 40% liquid fuels produced from domestic resources, and the second was a strategy for the private sector-driven further development of the synthetic fuels industry, based on a package of various forms of state support (see Chapter 4 for a more detailed discussion of these developments).

[15] Allowing the burning of coal with a very low calorific value (energy content), which in many instances had no previous economic use (and thus was not considered part of the coal reserve).

The Department's role in electricity policy during this period was far more marginal and difficult. In statutory terms, the DMEA's role in the electricity sector consisted mainly in providing support to the Electricity Control Board (ECB), which was also chaired by Neethling. The ECB's statutory influence and political importance, however, was very limited. Energy policy-makers in the DMEA had neither the institutional authority, nor the capacity, to influence electricity policy at the time, despite the widespread unease in various other locations in government concerning Escom's autonomy from economic and industrial policy processes. It required the appointment of a Commission of Inquiry by the premier to intervene:

> "I don't think the DMEA had the capability of in any way analysing what was happening in Eskom. They didn't have the capacity; they didn't have the power. Dirk Neethling at the time was the boss; he was a Chief Director, who is not a tremendously senior guy. The chairman of Eskom, who was possibly earning three times what he did, had direct channels to the Prime Minister, which Dirk Neethling didn't. Eskom itself was a powerful body, still is a powerful body, make no mistake. They had something like 70 000 people, they had vast resources; if they wanted to do something and analyse something they could do so – the Energy Branch had 30 people – so that's why a commission was required.." (Interview with J Basson).

One of the outcomes of the Commission was to integrate Escom more closely with the political and administrative system, which included Neethling's appointment to the Electricity Council; however, the state's policy goals regarding Escom were not primarily energy policy goals, despite the emphasis placed on energy policy by the Commission. The recommendations of the Commission actually weakened the Energy Branch's grasp on electricity policy and governance through two measures: first, the ECB, which was one of the primary forms of influence which the Energy Branch had on energy policy, was marginalised, and second, instead of vesting a government department such as the DMEA with the task of energy policy-making (which would have led to the establishment of a significant electricity policy capacity in the Energy Branch), this task was largely devolved onto the newly-created Electricity Council, which assumed the primary oversight function. Electricity policy, and Escom in particular, was not seen by the government as primarily within the energy policy sphere, but within an economic policy context, with other parastatals in the process of restructuring for possible privatisation. This shift was completed in the late 1980s, when Eskom was moved from the nominal oversight of the DMEA/NEC to a newly-created Office of Privatisation. Escom's expansion programme (concerning which a number of strategic decisions were taken in the mid and late 1980s), and other later initiatives such as the electrification programme, were subject to Electricity Council scrutiny, but not considered in a broader energy policy context.

The generalisation of the government's commitment to energy conservation, pioneered in the 1970s as a short-term measure to cut oil import requirements, consisted, apart from the publication of a set of posters in the early 1980s (Department of Mineral and Energy Affairs Annual Report 1984:60), of two initiatives. The first and most significant was the petrol conservation programme, which was a contingency measure enforced only until longer-term supply policies were successfully implemented. As a result, restrictions aimed at reducing petrol consumption were entirely removed by 1985 (despite the continuing oil embargo) because of the success of the Sasol projects and the state's oil procurement operations. More structural energy efficiency policies, such as increasing the efficiency of vehicle motors or promoting public transport, did not form any part of the Energy Branch's activities[16]:

> "..public transport wasn't in our department.. ..and of course our general public in South Africa, particularly the more affluent people, the white people, weren't prepared to give up their cars and go by bus to town" (Interview with S Van Den Berg).

The second initiative was electricity conservation, which had been mooted both by the Department of Planning's energy section and by the BTI inquiry in the late 1970s, in response to the expansion-linked price increases of 1976-7. As noted above, these initiatives did not succeed due primarily to the opposition of Escom[17]. The impetus for electricity conservation was forcefully reinstated by the De Villiers Commission, which advocated a major role for Escom in promoting various forms of electricity efficiency to mitigate the massive investment requirements. As a result, the Cabinet established a Working Group (Department of Mineral and Energy Affairs Annual Reports 1984:58; 1985:59) on electricity conservation in 1984, which concluded by 1985 that demand-side management programmes, managed by Escom, were the most appropriate intervention, thus ruling out longer-term efficiency options[18]. At the time these appealed to Escom, which was facing critical short-term supply problems in peak periods, and did make significant load-shifting arrangements with key large-scale users, including the introduction of time-of-use tariffs, and providing advice on electricity application (Conradie & Messerschmidt 2000:284-5). This enthusiasm was of short duration, however, since by the late 1980s the utility was facing an overcapacity problem: post-De Villiers tariff structures were

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[16] Programmes to encourage use of public transport were ineffectively pursued by the Department of Transport, but these were not integrated in any way with energy policy activities, and were not researched by energy policy planners. Because of the structure of apartheid society, these were directed mainly at white commuters, since car ownership amongst black commuters was extremely low (due to income inequality and other factors), and the latter were thus all using public transport, which was unsafe and inefficient. The spatial planning practices of apartheid, which distorted settlement patterns in and around cities, exacerbated the problem and made the transport system even more inefficient.

[17] This itself is curious, since the energy section identified Escom as a major participant; since these might well have involved demand-side policies, the participation of Escom was not essential. However, neither the institutional resources nor the organisational capacity existed to plan or implement this kind of initiative in the late 1970s; thus, Escom's participation was probably essential.

[18] This in any case is implied by the term 'conservation', although DSM programmes are not conservation or efficiency programmes in the strict senses of the concepts.

designed to promote the development of electricity-intensive industry[19], as Eskom's official history correctly notes:

> "..there is no doubt that this radical approach helped significantly to encourage the growth of electricity-intensive industries in South Africa.." (Conradie & Messerschmidt 2000:286).

Thus electricity conservation initiatives were firstly not based in the Energy Branch (and thus did not form part of a comprehensive conservation programme) and secondly, degenerated from the long-term De Villiers vision into a short-term load-management strategy for Escom, which had switched to programmes aimed at *boosting* electricity consumption by the end of the decade. Thus, by 1986, a comprehensive energy conservation programme did not really exist.

The general function of the planning division was the development of broad energy policy frameworks *per se*, as it had been in the 1970s; attempts were made to achieve this via three activities: the first was energy planning (which included the establishment of data collection routines and energy modelling), the second was research activities undertaken through the NPER, and the third was through the development of an Energy Policy White Paper (through the EPC) in the mid-1980s. Although these activities were best undertaken as a co-ordinated whole, there was in fact very little co-ordination between them.

Energy Planning was consistently advocated as the basic solution to energy policy problems during the apartheid era, but ironically not much of it actually took place, due to lack of both capacity and data, as noted by an energy policy researcher at the time:

> "..[the Energy Branch] had a Directorate called energy planning, but it did not do any planning.. ..to do any planning, you require data, and they had two very junior people working on data, but they did nothing with the data" (Interview with J Basson).

The skills problem was partly addressed through the IES at RAU, which was by the early 1980s run by Kotzé, who had been appointed professor in the late 1970s: however, the work of both the IES and of its students consisted largely in updating Kotzé's 1960s econometric model. Another more severe problem was data: the 1979 legislation prohibiting the flow of information on the liquid fuels industry, coupled with the general secretiveness of the energy supply industries and a lack of energy data-collection institutions or infrastructure, crippled attempts at energy planning: the sector with the highest priority in the early 1980s, liquid fuels, could thus not realistically be subjected to planning processes. Despite this lack of actual output, energy planning was increasingly stressed as the central activity of energy policy-making.

The second focus of activity of the planning division was the development of an energy research programme, the NPER, which by 1981 fell within the planning division's ambit. The NPER was

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[19] It is of course possible to encourage the development of energy-intensive projects which also use energy efficiently, but very low energy prices, which were generally the key factor in this encouragement in South Africa, tend to result in investment in less efficient but cheaper capital equipment, which is in fact what occurred (see Chapter 4).

significant in two ways: first, it widened the scope for energy policy interventions, which included the gradual shift to a broader conceptual framework for energy policy including demand-side interventions; and second, it introduced a new institutional culture (research) to the largely orthodox apartheid state bureaucratic culture of the DMEA, which would have its most significant impact when the NPER was incorporated into the NEC. Whilst NPER researchers were not bureaucrats, they were part of the CSIR, which still formed part of the state; however, much of the NPER's work consisted of funding outside researchers. The concept of 'energy policy research' was not clearly-defined, and included a range of subjects from highly technical studies of power plant efficiency (more common) to rural development issues (less common); this in turn produced a range of work which would not have emerged from the civil service. However, the cost of this distance was that very few research initiatives led to policy change. There was poor co-ordination between the Energy Branch and the research programmes, which was partly due to a lack of capacity in the Energy Branch (too few personnel with too few skills), and partly because of a lack of understanding of the relationship between research and policy. As one researcher commented:

> "..the Department was so busy with its own activities, that research was not something that they really wanted.. ..we from the NPER often went to them and said 'what are your needs?' and they couldn't express them" (Interview with J Basson).

However, the lack of co-ordination also meant that the NPER could explore energy policy-related areas which were not directly related to policy activities within the Energy Branch.

Research began in 1980 with research programmes on aspects of coal utilisation continued from the work of the Fuel Research Institute, which was incorporated into the CSIR by 1980, and electric vehicles, a research project initiated by the Department of Industries in the 1970s (Department of Mineral and Energy Affairs Annual Report 1980:75). This expanded into technical programmes related to coal "exploration, exploitation and utilisation", alternative transport fuels (including synthetic fuels), energy utilisation and conservation, and "renewable non-chemical energy sources and energy storage" in 1981 (Department of Mineral and Energy Affairs Annual Report 1981:62). In 1982, the programme was restructured into three groups: coal research (which included extraction and end-use technologies), "Energy in Transportation" (which involved electric vehicles, alternative liquid fuels – synthetic fuels and others, such as biomass-derived fuels – and fuel conservation), and "Alternative Energy Technologies" (which included a broad range of projects, including renewable energy sources, energy conservation – load-shifting and end-use efficiency – and "energy for development" or "appropriate technology" (see below)). In 1983 programmes in energy modelling and energy information systems were added to this, which established the structure of the programme until 1987, when

the NPER was incorporated into the National Energy Council (Department of Mineral and Energy Affairs Annual Reports 1980-1987).

One of the most significant areas of research which the NPER embarked on was energy poverty. Up until then, questions concerning black poverty had largely been ignored by the apartheid state. In terms of access to energy services, black households were severely disadvantaged in terms of both access and affordability, and as discussed in Chapter 4, the level of electrification of black households was extremely low. The key development, which was facilitated by the NPER's interest in the issue, was the reconceptualisation of a disparate set of problems as an *energy* problem. These included a range of issues which were being investigated by researchers at the time, which were divided into two converging areas of interest. The first was electrification, which was initially driven by a concern in the 1970s with air pollution in urban areas caused by coal smoke, which led to an abortive electrification project in Soweto, South Africa's largest back township. The second was a growing interest in the problems of fuelwood scarcity in rural areas, associated with deforestation and other problems such as increased collection times (having to walk further), as well as respiratory and associated problems linked to fuelwood use. The added significance of the energy poverty issue was that it was primarily a demand-side issue; thus considering it as an energy policy problem required a significant conceptual innovation. The range of complex issues which were embraced by the problem of energy poverty were allocated to several different government agencies, or to none at all. The Energy Branch and the Minister understood the scope of energy policy to include (at its maximum) the *supply of commercial energy carriers*, which included paraffin, but excluded firewood, and also excluded electrification, which, apart from rural electrification projects (to connect remote white farmhouses to the grid, carried out by Escom), was regarded as the domain of local authorities in terms of contemporary government policy:

> "..the Department basically said that things like providing electricity by local authorities is not their concern, it's the local authorities' concern – they had no mandate about that, and didn't do anything about that.." (Interview with J Basson).

Other issues such as firewood were not understood as energy policy issues at all:

> "In 1986, we [NPER researchers] had a morning session with the Minister and the DG of the Department, basically giving inputs to them as to what we were busy with in the NPER, what we found, and some indicators as to the support we wanted from them. I gave a lecture on the issue of firewood, how important firewood was, how it was being used, how much it was being used, the fact that we were losing firewood in certain parts of the country, that there were no programmes of replacing the firewood and so forth, and the Minister lent over to the DG during this presentation and he said to the DG: 'but firewood is not our responsibility'" (Interview with J Basson).

The point at which energy poverty began to become an energy policy issue was in 1983, through the NPER's 'Alternative Energy Technology' programme. The programme was begun in 1981 as a research programme into renewable energy, particularly solar energy, and its possible application in remote areas of the country. This was regrouped into an 'Alternative Energy Technology' research programme in 1982, which began in 1983 to investigate, via a contract with the ERI at UCT, issues related to energy use by poor rural households. The research was recast in 1985 as research into 'appropriate energy technology', defined as "third world energy technology" and "bio-energy (energy from all organic material of biological origin)" (Department of Mineral and Energy Affairs Annual Report 1985:73), which in practice meant in the latter case research on fuelwood supply and demand, and in the former, remote energy solutions for poor rural households. Research was again recast in 1986 as "Energy for Developing Areas", which again referred to energy requirements of poor rural households. The shift from 1981 to 1986 from a technical supply-oriented approach to a more integrated demand-side approach[20] came about through a number of factors, including an increasingly critical attitude to apartheid policies amongst researchers within the CSIR (a more difficult proposition for bureaucrats in the Energy Branch), and, most importantly, the funding of a series of research projects at universities on various aspects of energy poverty, which would not normally have been funded by state agencies for political reasons[21]. These research projects included pioneering work (since no-one had systematically studied the energy poverty problem in South Africa before in any detail) at the ERI, where ground-breaking surveys were completed on energy demand and usage patterns by poor rural and urban households (Eberhard 1984, 1986); from 1986 the NPER also funded some work at UCT by Charles Dingley on urban electrification, which was influential in the later establishment of a large-scale electrification programme. Thus, the NPER created a space for non-governmental researchers to begin developing what ultimately became the primary post-apartheid energy policy context.

The final policy development of significance in this period was the development of the 1986 White Paper. The first comprehensive statement of energy policy goals was contained in the 1981 Annual Report:

> "1 – an uninterrupted energy supply at reasonable cost, from both domestic and foreign sources
>
> 2 – a continuously decreasing reliance on imports of crude oil within the bounds of strategic and economic considerations

[20] In research commissioned by the NPER, and their conceptual framework, but not in actual policy terms.

[21] Research on poverty in the 1980s was generally associated with a critical attitude to apartheid, and the outcomes were generally damaging to the apartheid state's legitimacy.

3 – optimal extraction of coal, the country's major source of energy, to provide for adequate future supplies

4 – exports of reasonable quantities of energy carriers, notably coal and uranium, to enhance foreign exchange earnings

5 – the active pursuit of conservation of energy in all sectors of the economy

6 – research and development on a level commensurate with the various policy objectives and priorities

7 – the continued search for domestic resources of natural oil

8 – continued further development of the local synthetic fuels industry, preferably by the private sector

9 – appropriate long-term energy policy planning to provide for, in particular, orderly and timely phasing in of alternative sources of energy" (Department of Mineral and Energy Affairs Annual Report 1981:59).

This list was a codification of energy policy priorities as they existed at the end of the 1970s. By 1984, the short-term policy goals of the apartheid state's energy strategy had been achieved: coal production had been dramatically expanded, extraction rates and mining techniques transformed, energy security existed in coal, liquid fuels and electricity provision, and the synthetic fuels industry was operational and, in terms of the state's criteria, economically and technically a success. In 1984, the Minister of Minerals and Energy instructed the EPC to oversee the drafting of an Energy Policy White Paper, which was announced at the 26th meeting of the EPC, held at Secunda to commemorate the 10th anniversary of the initiation of Sasol 2 (Department of Mineral and Energy Affairs Annual Report 1984:26). The motivation for producing a White Paper at that point was based on a number of factors. The first was the acceptance in government that the 1979 oil crisis had led, not to a temporary embargo (as the 1973 crisis had), but to a permanent 'oil emergency', which would have long-term impacts on the South African economy (1985 Draft Energy Policy White Paper:1). Following from this was the requirement for more effective co-ordination of energy policy-related policy activities, including co-ordination with the private sector, which was the dominant investor in coal production, and was being encouraged to invest in synthetic fuels projects.

A Draft White Paper was tabled in 1985, and the final White Paper in 1986. Although there is a consensus amongst senior DMEA officials that the White Paper was "not implemented" (Interviews), this is only partially true, and the documents are in any case a cogent expression of the apartheid state's energy policy establishment's thinking at the time, although it was surprisingly devoid of specific policy programmes and recommendations, and extremely short. The most important feature of the documents was not the policy goals proposed (which were not a significant departure from existing policies), but the institutional framework outlined for the

furtherance of the energy policy project (which was very significant). The final version of the draft was written by Neethling himself, and the White Paper itself was signficantly modified by the EPC, and was significantly less ambitious and more politically and organisationally workable. The key components of the White Papers consisted of a broad ideological and policy framework derived from general policy goals of the apartheid state, an institutional vision for the energy policy project, and frameworks for specific policy goals.

The first component contained various elements which had become important to the apartheid state in the late 1970s and early 1980s. The first element of this was a commitment to the 'independent states' myth which underlay the late-1970s programme of 'independence' of parts of South Africa included in the apartheid-era 'homelands' or Bantustans; there was thus a commitment to "..the countries of southern Africa in general" in developing energy institutions and policies[22] (1985 Draft Energy Policy White Paper:1; 1986 Energy Policy White Paper:6).

The second, and far more significant, component was the commitment of the Botha regime, and of Neethling, to 'private enterprise', which took a number of forms in relation to energy policy. The first was an ideological shift within the apartheid state from a highly interventionist state with a culture of regulation and price control to a commitment to 'free enterprise', competition, deregulation and privatisation. Botha held a series of conferences with business leaders from the late 1970s; at one of which he asserted that it was "the Government's serious intention to expand further the system of free enterprise" (quoted in Mann 1988:61).

This implied not only a change in the government's attitude to the economy, but also two other developments which affected the energy sector. The first was the emphasis on, and necessity of, involving the private sector in key policy processes, and the second was the 'corporatisation' of key energy institutions, which were restructured with a private-sector veneer. Specifically, Neethling's experience with the Minerals Bureau and the operation of the Minerals Policy Council, which was set up in the late 1970s and was primarily a forum for the co-ordination of the state's strategic goals in the minerals sector with the privately-owned minerals industry, as well as the success of the privatisation of Sasol, the state's strategic energy project *par excellence*, had provided inspiration for the approach outlined in the White Papers, which emphasised that

> "..although the State has the major responsibility for administering the overall energy policy, the *private sector and the State are jointly responsible* for formulating that policy and

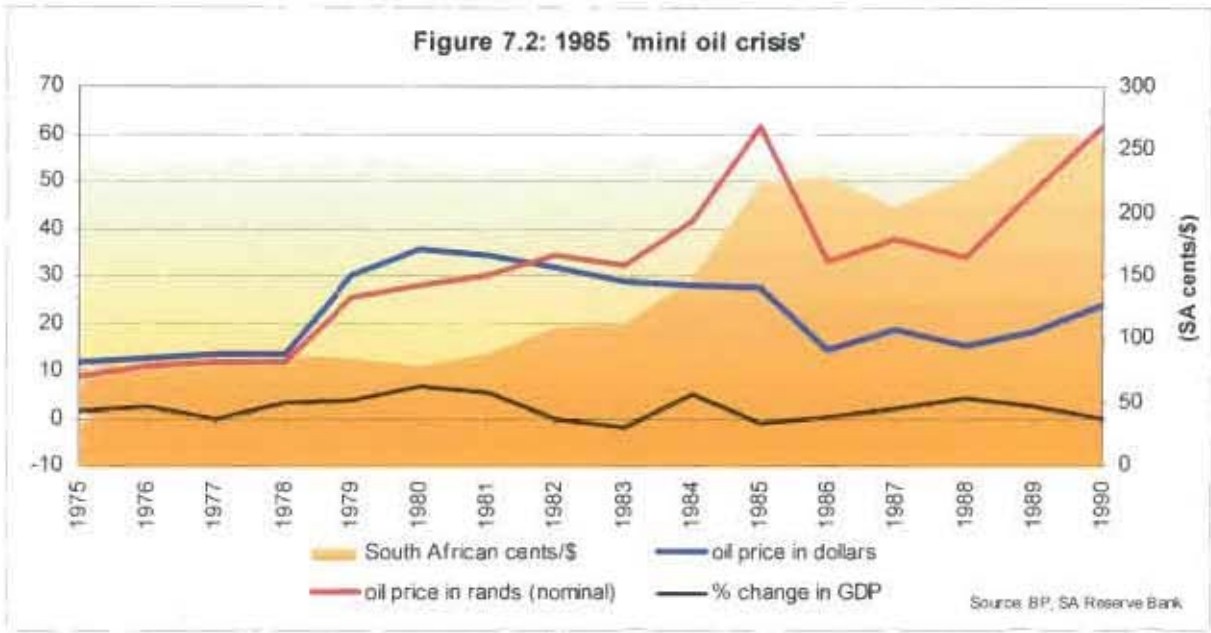
[22] Limited co-operation with real southern African states occurred slightly later (following the Nkomati Accord with Mozambique), and was tainted by the South African threat of military strikes against their capitals in reprisal for hosting ANC delegations, as well as the support of the apartheid state for military and economic destabilisation. Real co-operation on energy issues only emerged in the 1990s.

identifying priorities for the effective implementation of strategies" (1986 Energy Policy White Paper:11).

The policy framework for the White Paper aimed at achieving "..the highest measure of freedom for market forces" and "involvement of the private sector in the formulation and implementation of the strategies" (1986 Energy Policy White Paper:7). In practice, in one of the most heavily-regulated sectors of the economy (apart from coal, which was deregulated in 1985), the aim of these sentiments was to integrate the private sector into the policymaking and implementing process, rather than to deregulate energy markets, which did not in fact occur. The emphasis on "market forces" and "private enterprise" co-existed in an uneasy tension with the other main emphasis of the White Papers: energy planning.

This was more forcefully expressed in the Draft White Paper, which proposed an "energy management system" as the core of energy policy activities, which would consist of an 'Energy Policy Committee', which would advise the DMEA on the implementation of 12 "individual energy plans", and the integration of these into an overall "Energy Plan", divided into a long-term 15-year plan, revised every 5 years, and a short-term 5-year plan, revised every two years (1985 Draft Energy Policy White Paper:3). Individual energy plans were provided as an annex to the Draft Energy Policy White Paper, covering energy conservation, coal, uranium, indigenous oil and gas, renewable energy, new energy technologies, electricity, petroleum products, synthetic fuels, the energy research and development programme and "interstate co-operation in the field of energy" (1985 Draft Energy Policy White Paper:5). These plans reflected fairly accurately the institutional limitations of the DMEA, containing as they did a detailed policy programme for liquid fuels and coal, a summary of the De Villiers Commission for electricity, nothing on nuclear power other than an assessment of uranium production, and a statement of existing conservation measures, plus plans for future, more general programmes (primarily involving a publicity campaign) (1985 Draft Energy Policy White Paper:6-29).

The system was refined in the White Paper as a "centralised and co-ordinated national energy planning system", consisting of the sub-plans (minus interstate co-operation), and with 'energy conservation' converted to 'energy efficiency', plus a 30-year long-term plan, and a 5-year plan, the first of which was due to be published in 1986/7 (1986 Energy Policy White Paper:9-10). The process would be overseen by an 'Energy Advisory Council' consisting of representatives of relevant public and private-sector bodies, supported by "a rationalised national research and advisory committee system", which would include the NPER. In addition, CEF would play a significant role in its restructured form, including as "..a *fundamental element* in the future of financing of government involvement in large-scale energy projects of a strategic nature..", and the financing of "energy-directed research and development projects" from a portion of the CEF



levy, as well as the existing research levy on coal, and a new levy on electricity (1986 Energy Policy White Paper:11-12).

Thus at the end of the period in 1986, the state had endorsed the most ambitious plan for increasing the capacity of its energy policy apparatus, and extending its reach considerably, which was an attempt to solve some of the continuing co-ordination problems still extant in 1986. The broad political motivation for doing this was provided by a 1985 financial crisis in the country caused by a refusal of international banks to refinance South Africa's foreign borrowing (because of the ongoing political instability), coupled with a recession. The result was a precipitous fall in the rand, which caused a 'mini-oil crisis' in 1985, as the rand price of oil soared dramatically, as portrayed in Figure 7.2 above, which again focused policy-makers' attention on the oil problem. The period was characterised by the centralisation and co-ordination of liquid fuels policy organs (including the CEF), which saw liquid fuels displace coal as the most important focus of energy policy activity, but an ongoing failure to integrate other supply sectors, initiate a comprehensive conservation programme, or develop an energy planning capacity. An additional factor was a significant slowing of economic growth (and a recession); whereas in 1979, energy demand growth was very high, by the mid-1980s it had slowed significantly. Politically, the mid-1980s was the high point of political support during apartheid for the energy policy project, but as the institutional reforms following the White Paper unfolded, the crisis began to diminish with the oil price, and political support began to wane.

4) 1987 to 1992

The fourth phase of the development of South African energy policy and institutions was characterised by a lack of major energy policy initiatives, with the exception of Mossgas, which had been initiated in the previous phase. At the same time, the broader context was changing

rapidly: in 1987 the apartheid state was facing a severe political crisis consisting of an insurrection which was no longer significantly curbed by state repression, the failure of Botha's 'reforms', and growing international pressure, exacerbated by the refusal of international banks to reschedule South Africa's foreign debt in 1985. Two events in 1989 changed the course of South African politics radically: first, Botha was replaced as President by F.W. De Klerk, and second, the Cold War drew to a close with the fall of communist governments in eastern Europe, thus depriving the apartheid government of the strategic context within which it maintained support from its key allies, the US and the UK. De Klerk swiftly intensified a process of negotiation (which had begun under Botha, but rapidly stalled) with the leadership of anti-apartheid movements, which culminated in the unbanning of the ANC and release of political prisoners in 1990, the signing of a National Peace Accord between the government and the ANC in 1991 which resulted in the beginning of transitional negotiations (the inauguration of the Convention for a Democratic South Africa (Codesa), in which transitional arrangements and an interim constitution were negotiated), the signing of a 'minute of understanding' between the ANC and the NP in 1992, which signalled the beginning of negotiations in earnest, and finally the establishment of a Transitional Executive Council in 1993 to govern the country in the run-up to the first post-apartheid elections in 1994 (O'Meara 1996:410-413).

The significance for energy policy was that from 1989, the strategic imperative which had underpinned the initiation of the energy policy project, as well as its major programmes, began to disappear as the transitional process unfolded. The nuclear establishment's 'special relationship' with the political elite was terminated by De Klerk in 1990 with his order to dismantle the weapons programme, coal export restrictions were lifted in 1991, and no further synthetic fuels projects were contemplated. More significantly, the importance of energy policy *per se* declined in the view of the political elite as the threat of sanctions disappeared; this was combined with a trend towards deregulation (other than in liquid fuels) and privatisation, which, although it did not have significant practical outcomes in the energy sector, undermined the case for more co-ordinated planning processes for the energy system as a whole. The period began with the inauguration of the most ambitious energy policy institution of the apartheid era, and ended with the demotion of the energy policy function to a lower bureaucratic status than the Energy Branch had in 1980.

The establishment, structure and demise of the National Energy Council (NEC)

The main institutional outcome of the Energy Policy White Paper was the passage of the 1987 Energy Act (42/1987), which established the National Energy Council (NEC), the third institutional innovation for energy policymaking and governance in the apartheid state. The NEC

was, in the context of the apartheid state, a very unorthodox and innovative attempt to address the severe institutional limitations of the apartheid state's energy bureaucracy. The structure consisted of the Council[23] itself (the 'Energy Advisory Council' in the White Paper), which replaced the EPC, and borrowed its institutional composition from a combination of a company board and a stakeholder forum. The key energy producers were represented; the traditional state entities (including the now privatised Sasol) by their CEOs or Chairpersons (Eskom, AEC, CEF, Sasol), and the private sector via the Managing Director of Amcoal[24] (rather than through an industry association), and the oil industry via the retired Chairman of one of the four oil majors. Consumers were sporadically represented, directly via the Automobile Association, the Housewives League, and the South African Agricultural Union (representing commercial farmers), and indirectly through a small number of business people. Representation of government departments was limited to the DMEA, the CSIR and the Department of Finance, and other representatives included a school principal and a middle-ranking official from the Department of Education (National Energy Council Annual Reports 1987-1991).

The Council was chaired by D.P. De Villiers, previously chairman of Sasol and Soekor, and its vice-chair was W.J.L. De Villiers, CEO of the AEC (National Energy Council Annual Report 1988:3); the former was one of the architects (and implementers) of the oil security strategy during his time in Sasol. What is significant about this list is a) the NEC's primary function as a means for continued co-ordination of *state* energy sector activity, with only limited representation of the private sector or private energy industry (despite the White Paper commitments), and b) the limited and arbitrary nature of consumer representation, which excluded both systematic representation of private industry and/or business, and energy-intensive users. This was indicative of the government's perception of energy policy as defined primarily by the liquid fuels-coal nexus (both the AA and the SAAU were important liquid fuels consumers), which would also partially explain the lack of official representation from the oil industry. Electricity consumers (including energy intensive users) were in fact represented on the newly-formed Electricity Council. The final notable feature of the Council was the relatively high status of the nuclear establishment (the AEC's CEO serving as the Vice Chairman).

The Council was supported by an additional set of 'Advisory Committees' in coal (a statutory body, the Coal Advisory Committee(CAC)), coal mining research, electricity, energy efficiency, transport energy, and 'new and renewable energy' (National Energy Council Annual Report 1988:7), which had far more detailed stakeholder representation by sector, other than the energy

[23] The term 'NEC' is ambiguous in this context, since it refers both to the actual Council, as well as to the body as a whole (in this context, usually a reference to the staff); thus, from now on, 'Council' will refer to the Council itself, whereas 'NEC' will refer to the whole organisation (the staff).

[24] Amcoal, a subsidiary of Anglo American, was consistently the largest coal producer in the country.

efficiency committee, which was chaired by Eskom and consisted of experts, businesspeople and others. In addition to these, the ECB was also affiliated to the NEC. The role of these committees was to provide detailed recommendations to the NEC on specific sectoral policies: since the dominant policy activity of the NEC was research, a large portion of the activities of the advisory committees was concerned with the scope of research programmes (National Energy Council Annual Report 1991:2-13). Involvement by the private sector thus was more significant in the sectoral committees than in the Council itself, which was populated by political 'insiders', who were required to obtain security clearance because of the strategic aspects of energy policy: meetings of the Council were highly confidential, and the minutes were circulated to a very small circle of officials. The Council struggled to develop a consensus on energy issues, which became broader and less focused with the decline of the strategic imperative, which also removed the political incentive for co-operation:

> "..one of the reasons why that Council did not work, was that it consisted of the boss men of the energy businesses, and other very powerful people.. ..these council members were so intent on looking at their own well-being that the council was basically stagnant – it couldn't move; because if a decision was made that favoured nuclear energy, then something else wasn't attended to, and if something was done that favoured synthetic fuels, it didn't favour conventional fuels, and I think this is one of the reasons why this kitty of money wasn't spent, because these guys didn't have a specific vision of where they were going – they were all looking at their own interests.." (Interview with J Basson).

The Council was supported by an organisation consisting of staff which had been transferred from the Energy Branch, as well as the NPER (which was integrated into the NEC), which involved another merging of institutional cultures: unlike the staff of the Energy Branch, the NPER researchers were not career bureaucrats, and found the autocratic culture of the apartheid civil service alien; at the same time, they brought a strongly technocratic understanding of policy processes (of which they had little experience) into the NEC, which was particularly influential in the transitional process, since the chief energy bureaucrat during the transition, Johann Basson, originated in the NPER (Interview with J Basson). This had two effects: it contributed to the political irrelevance of policy, and at the same time, it extended the space available to researchers and policy analysts inside and outside the NEC to develop energy policy alternatives outside the apartheid-era energy policy paradigm.

This institutional clash took place in an institutional context which was unique in South Africa. The NEC was what Neethling, the NEC's newly-appointed 'CEO', referred to as "a private/government sector institution", which had civil service-like statutory functions and restrictions (for instance, the creation of new posts had to be approved by the Commission for

Administration[25]), but which styled itself as a business organisation, headed by a CEO, divided into 'Groups' which in turn were headed by 'Group Executives', and installed itself in a new location outside the DMEA's more austere building in what resembled a corporate headquarters. The shift in the White Paper towards the private sector was thus also espoused as a path to successful policy-making and regulation; as the former Chairman of Sasol[26], the Council's Chairman, observed in 1988:

> "It was particularly heartening to those members of Council from the private sector to observe, from the outset, the determination amongst personnel to achieve a declared objective of developing a private sector culture in this new organisation.." (National Energy Council Annual Report 1988:2).

Neethling described the NEC as

> "..a milestone in the history of energy policy formulation and implementation in the RSA, which not only paved the way for further privatisation of the Government's role in the country's energy affairs, but.. ..will also involve the private sector on the highest level in the overall planning, co-ordination and guidance of energy policy.." (National Energy Council Annual Report 1988:4).

The NEC thus took over the statutory and other functions of the Energy Branch (with the continued exclusion of the AEC and nuclear legislation), as well as the NPER. The combination of statutory activities, research and co-ordination with stakeholders posed certain challenges, since statutory functions, including regulation and administration, were carried out by the NEC, but the staff carrying out these functions were formally accountable not to the NEC, but to the DG of the DMEA or to the Minister (National Energy Council Annual Report 1988:2). The creation of the NEC led to the amalgamation of Ministries (not Departments); one Minister of Economic Affairs and Technology oversaw the DMEA, the NEC and the Department of Trade and Industry (and appointed the Council), which was indicative of a shift from a resource-based view of the energy sector to an industry-based view. By 1990 a new Minister of Minerals and Energy was appointed.

The institutional solution to accommodation of the administrative functions, with their separate line of reporting, was to house them in a single 'Group', one of three in total. The group functions were derived from a fusion between the organisational structure of the Energy Branch

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[25] The Commission for Administration oversaw the entire civil service; changes to structure, function and number and level of posts had to be approved by it. It was somewhat inflexible in matching the level of posts to specific policy areas, and applied a rigid formula to the ratio of junior to senior/professional posts; thus, in a case such as the Energy Branch, which required many senior professionals for analysis and negotiation with powerful stakeholders, the Commission would only grant one senior/professional post for every three junior posts, which contributed to chronic skills shortages in the energy bureaucracy.

[26] This was an ironic reflection on De Villiers' part, given that Sasol had only recently been privatised, and was still largely state-owned, and had been during his tenure, and also heavily protected from competition, and subsidised. Thus it was not subject to any of the rigours of the market, which is normally considered in this type of discourse to be the source of the virtues of 'private sector culture'.

and that of the NPER. The former was divided into an 'energy supply' and 'energy planning' division, which in practice involved a division between regulatory/administrative functions on the one hand, and research and policy development on the other. The NPER had been divided into four research groups: coal, 'energy in transport', 'alternative energy technology' and 'systems and models' (Department of Mineral and Energy Affairs Annual Report 1985:71).

The NEC's three Groups were 'Energy Administration and Management' (which maintained its title for 5 years), 'Electricity and Coal' ('Electrical Energy, Energy Efficiency and Strategic Planning' in 1989, 'Electrical Energy, Energy Efficiency and Decision Support' in 1990, and 'Coal, Electrical Energy, Energy Efficiency and Decision Support' in 1991 and 1992), and 'Transport Energy' ('Transport Energy and Energy for Development' from 1989 onwards). Thus the first group administered liquid fuels legislation and liaised with the liquid fuels industry, as well as providing support to the ECB and nominally overseeing CEF; the remaining coal functions were administered by the second group, but these were attenuated by 1987 to monitoring the export programme and the coal resource base. Thus the second and third groups presided over an extensive research and development programme, which included projects on coal production and utilisation, alternative and synthetic fuels, and energy planning and modelling.

A key feature of the NEC was the way it was funded. While some of its funds came from the fiscus (and formed part of the government's budget), the rest were derived from levies on liquid fuels, coal and electricity, which were collected by CEF, which allowed the NEC some latitude in addressing the significant lack of capacity which had existed in the Energy Branch: staff levels increased from around 30 in the Energy Branch to around 60 in the NEC (see footnote 25). The main function of the additional budget was to fund research projects (in a range of fields from economic analysis to the development of technical solutions), which were contracted to universities, the CSIR, state corporations and private companies in the energy sector, and were intended, by the early 1990s, to lead to a number of large-scale demonstration projects, but these never materialised (see below).

The NEC experiment was halted in April 1991 (through the Abolition of the National Energy Council Act 95/1991), and the staff and functions of the NEC transferred back to the DMEA after a transition period of a year. The actual decision to reincorporate the NEC into the Energy Branch followed a process of investigation into funding and accounting processes within the civil service (which was an outcome of the accession to the presidency in 1989 of F.W. De Klerk, who attempted to rein in some of the excesses of the Botha era), which led to the appointment of another inquiry carried out by a retired Director-General of the Department of Trade and Industry into the energy functions in government. The main point of controversy was

the funding of the NEC, which was underpinned by unease at its quasi-governmental (and quasi-independent) status, and the inquiry concluded that the best option would be to reincorporate the NEC into government (Hansard 27/5/1991:10709-10718, Interview with D Neethling). There were three underlying reasons for the demise of the NEC. The first was an outcome of the institutional innovation itself: Neethling and others had sought to solve some of the Energy Branch's problems (co-ordination problems, lack of capacity, and the restrictions of the civil service environment) by moving the energy policy function out of government, but this created its own problems, summed up by an NEC official:

> "..everyone was very enthusiastic in taking this function out of government and putting it next to government, and with hindsight, that was a mistake, because [the NEC was] doing a governmental function, of policy development, of policy management, of policy implementation, was away from the fire; and whereas government departments worked actively with each other and they saw each other as colleagues, this body was now seen as something different. We had offices that didn't look like governmental offices, things that the government did, wasn't done by the Council – the government had a tender procedure, the NEC didn't, etc.." (Interview with J Basson).

While the NEC partly succeeded in improving co-ordination with the private sector, co-ordination within the government system was worsened, and its political influence diminished. Another issue was the combination of the administrative functions with the largely research-based functions of the rest of the NEC, which hampered Neethling's idea of creating an independent agency which could operate across different governmental domains. The second reason was that the NEC had internal difficulties: the Council could not develop consensus on a broader energy policy framework, and did not share criteria with NEC staff for project evaluation: the Council were in favour of 'commercially-viable projects', whereas the NEC staff were in favour of more experimental projects; this difference resulted in the massive budget of the NEC remaining largely unspent by the time of its demise (Interviews with NEC officials). The third reason was that the transition process removed the main political impetus for energy policy *per se*, and the government had little interest in the most relevant policy development programme for the transition ('energy for development') in the NEC: thus, political support for the initiative, which was strong in the mid-1980s, was withdrawn in the wake of De Klerk's accession to power in 1989 and the beginning of the transitional process.

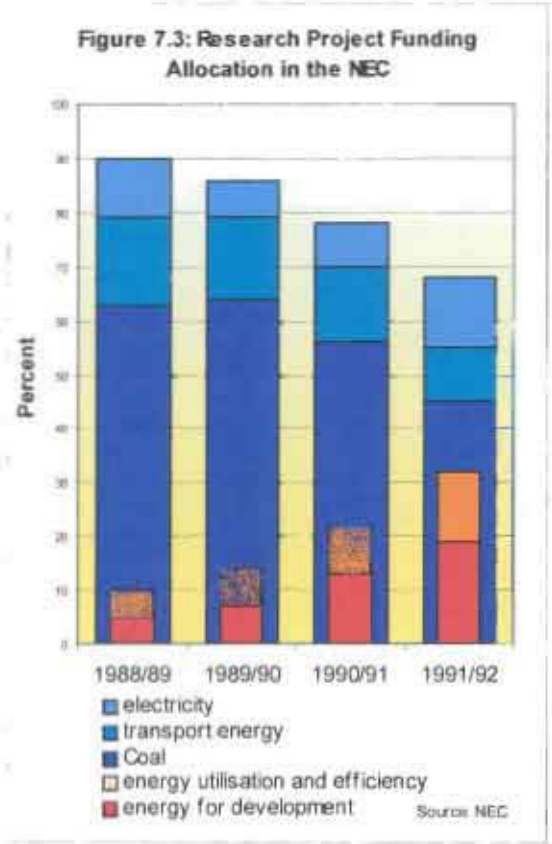
The result of the abolition of the NEC was threefold. The financial autonomy of the energy function in government was removed, and funding was significantly curtailed; research and development programmes were significantly curtailed; and a restructuring process was initiated which demoted the energy function within the DMEA and reduced its staff component. The immediate structure of the Energy Branch on the demise of the NEC was similar to that of the

NEC: it was headed by a Deputy Director-General and contained three Chief Directorates, which were a continuation of the NEC's Groups: Electricity and Coal, Energy Administration and Support Services, and Transport Energy and Energy for Development (National Energy Council Annual Report 1992:3). Following a Commission for Administration investigation in November 1992, the Energy Branch was downscaled and reduced from a 'Branch' to a 'Chief Directorate', which involved a significant reduction in status within the civil service and within the DMEA, as well as a reduction in staff from around 60 in the NEC to around 30 posts by the end of 1993 (Department of Mineral and Energy Affairs Annual Report 1993:53). This represented a significant cutback in capacity and signalled the demotion of energy policy in the ranking of national policy priorities, which accorded with the disappearance of the strategic imperative which had driven political interest in energy policy since the 1970s.

Policy Activities in the NEC

Despite the considerable institutional innovation involved in establishing the NEC, development of new energy policy initiatives was minimal during this period. Coal policy was limited to the removal of export restrictions in 1991 and ongoing monitoring of reserves, and was also the subject of an extensive research programme based on 1970s coal policy objectives, which covered all aspects of the mining and utilisation process, and was conducted in close collaboration with the Chamber of Mines. The most promising projects were aimed at utilising discard coal, massive quantities of which were produced as a by-product of the export industry, but none of these were implemented. Developments in liquid fuels policy were similarly limited, apart from the continuation of the Mossgas project and the partial renegotiation of the regulatory system with the oil industry in 1991; a 'transport energy' research project in the NEC did extensive work on alternative/synthetic fuels and on future potential synthetic fuels plants, but no further non-crude-based fuels projects were pursued. In the electricity sector, the NEC did in fact do research on various technical aspects of electricity generation and transmission, and funded work on electrification. Eskom's problem with overcapacity from the early 1990s eliminated the need for further expansion, and the most significant policy development during the period, Eskom's decision to embark on an electrification programme, was taken entirely unilaterally, although ironically probably based on research at UCT partially funded by the NEC and the NPER.

The main activity of the NEC, apart from regulation, was the co-ordination and funding of research projects. 'Research' was an imprecisely-defined term, and embraced many different kinds and levels of research. These can be roughly categorised into a number of levels, according to their proximity to the energy policy process itself, beginning with technical studies,



progressing to technical-economic studies, then to policy subsectors, and finally to energy policy studies. At the technical end of the scale, studies concentrate purely on technical aspects of a specific problem, whereas at the energy policy end of the scale, a range of competing considerations are matched with specific proposals. Most of the 15 pages of projects listed in the National Energy Council's 1991/2 Annual Report (1992:45-59) were technical studies[27], developed in close collaboration with the energy supply industry, thus locally useful but not easily integrated into energy policy processes (see below). There is a notable progression of funding allocation patterns during the NEC's existence, which were initially established by the traditional concerns of apartheid energy policy, but shifted significantly away from these towards the end of the period, as portrayed in Figure 7.3 above.

The traditional concerns of the apartheid state (coal, liquid fuels and electricity) received the bulk of research funding, but were progressively replaced by the new-era concerns of 'energy utilisation and efficiency' and 'energy for development'. The former programme, which expanded considerably during the lifetime of the NEC, did not have any significant outcome, and energy efficiency was only resurrected on a very small scale in the last few years by the post-apartheid government.

The latter programme, however, was highly significant. A continuation of the NPER's programme, the parameters for the programme developed from a fusion of energy demand studies of rural households, about which nothing was known, and a technical focus on 'alternative energy technologies', into a broader framework for approaching the problem of energy poverty. The significance of the programme was not its impact on policy, which was negligible during the NEC's existence, but for two other reasons: first, it began to develop a new conceptual basis for energy policy, and second, by funding energy poverty-related research, it enlarged the space available to researchers outside the orthodox apartheid-era energy policy community to develop alternative perspectives, which would be very instrumental in defining the

[27] For instance, "effects of pyrites oxidation on rehabilitation and pollution potential of coal mine residue dumps", or "Mossbauer effect spectroscopy on heterogeneous catalysis" (National Energy Council Annual Report 1992:48-49).

post-apartheid energy policy framework during the transition. The former reason was based on the demand-side approach inherent in energy poverty research, which could not easily be reduced to simple questions of supply, given the variety of energy carriers used by poor households and the complex determinants underlying their use (Mehlwana & Qase 1998, Eberhard & Van Horen 1995). There was thus a nexus between 'development' issues and a demand-side approach, a point made in the NEC's 1992 Annual Report proposing a "new form of categorisation" of the South African energy economy, in which

> "..the focus falls on the consumer rather than on the commodity consumed and is more suited to the blend of developed and developing sectors that characterise the South African economy.." (National Energy Council Annual Report 1992:4).

A demand-side approach to energy poverty, and later to the rest of the energy system, was pioneered by a new research centre at the University of Cape Town, which was one of the most significant outcomes of the NEC's research programme because of its influential role in energy policy processes during the transition. What rendered the NEC's support for the centre somewhat paradoxical was the broad alignment of its researchers with the anti-apartheid movement. The centre initially comprised part of the ERI, but formed a separate entity in 1989, initially as the Centre for Research into Appropriate Energy Technology (CRAET), and a year later as the Energy for Development Research Centre (EDRC). The EDRC was funded by the NEC for three years, from 1989 to 1992[28], and focused mainly on energy use by and technology for poor rural households, before expanding their brief to cover broader energy policy issues (see next section). The emergence and development of the NEC's interest in energy poverty issues, and the funding of the EDRC, was a result of the combination of a number of political currents. The concept of rural development was removed from the politically-charged area of urban poverty, and it existed outside the traditional scope of energy policy, or of apartheid policy per se; thus in policy terms, it was an 'unoccupied policy space'. In addition, the location of the NEC outside the traditional civil service, and the influence of a non-civil service 'research culture', facilitated the extension of the traditional delineation of 'energy research', and the creation of an unlikely relationship between an apartheid state agency and a community of researchers intellectually (and in many cases, politically) aligned with the anti-apartheid movement (National Energy Council Annual Reports 1989-1992). Frequent opposition from the NEC's or DMEA's leadership to the relationship with the EDRC (on account of their (correct) suspicions that the EDRC's leadership were aligned with the ANC) was partially deflected by NEC researchers (Interviews). Ultimately, the EDRC played a very significant role in successfully advocating

[28] The original contract with the NEC was for five years' funding, but because of the EDRC's relationship with the ANC, funding was cut in 1992, after only three years.

energy poverty-related policies during the transition, but the NEC, and later DMEA, were sidelined due to political constraints imposed by apartheid institutions and the apartheid government, as well as the politics of the transition.

The process of co-ordinating and integrating the Group activities into a broader energy policy framework outlined in the White Papers, based on a complicated energy planning system, was not implemented, and no energy plans were produced, partly from a lack of capacity, and partly from a lack of data, which was caused by a lack of data infrastructure coupled with secrecy legislation and practices within the energy sector. This lack of integration was matched by a decline in political commitment to specific energy policy outcomes. The NEC was initially tasked (via its founding legislation) with three goals:

> "a) to ensure that the energy resources of the Republic, and also those resources that may become available to the Republic from time to time, are exploited, developed and utilized in the best interests of the country, including research with regard to such exploitation, development and utilization; b) to promote the sound development of undertakings in the Republic; and c) to advise the Minister on methods by which the objects referred to in paragraphs (a) and (b) can best be achieved" (Energy Act (42/1987):Clause 3),

which were a succinct restatement of the traditional apartheid-era supply-side resource-based energy policy framework. By the time of the demise of the NEC, its CEO outlined a completely different vision of energy policy, which is worth quoting at length to emphasise the contrast between this outline and policy frameworks before and after it:

> "The major features of a realistic framework within which an energy policy and strategy for the future can be delineated fall into four major areas, each of which affects the others:
>
> - **Holistic**: Policy guidelines should take into account that energy is an inherent part of national macro-economic and socio-economic policies, that it is directly related to national energy security and that it should be environmentally sustainable.
> - **Integrated**: Energy supply and demand strategies are inextricably linked. So is the use of alternative sources of energy to supplement supply, including cogeneration, demand-side management, improved efficiency of use and production and the social dimension of improving both the quality of life and the standard of education.
> - **Balanced**: Apart from being a sustainable policy, a future national energy strategy must achieve a balance between the various domestic sources and carriers of energy. One should avoid becoming overly dependent on any one indigenous or imported resource and turning energy import dependence, like oil, into an energy security risk. Ultimately one strives to fulfil the country's increasing need for energy at reasonable prices which reflect the true cost thereof. Subsidies should be transparent and recognised as such.

- **Constitutional**: Energy has inextricable national, regional and local dimensions. In a new constitutional dispensation it is possible that a different framework may emerge which would reshape the management and implementation of energy at the various levels of government

An energy policy and supporting strategies formulated along the above-mentioned guidelines can only be achieved if it is supported by a proper institutional dispensation, appropriate long-term strategic planning procedures, flexible and adequate funding, a policy-directed technology support programme based *inter alia* on the principle of productivity, adequately trained manpower and finally, public debate" (National Energy Council Annual Report 1992:2-3).

This passage is more of a statement of principle than a policy framework, and was notable for two things: the first is its hybrid-like conceptual combination of some of the imperatives of the supply-oriented energy policy paradigm of apartheid (such as energy security) with a strong commitment to paradigm 2 and even paradigm 3 policy measures; the second is the remarkable distance between this framework and existing energy policy at the time: thus the provenance of this approach to energy policy was the research programmes. However, this fanciful but irrelevant and abstract energy policy framework was not sustainable, and was reassessed during the Commission for Administration's investigation of the energy policy functions in government in 1993, and was reformulated as the new Energy Chief Directorate's "terms of reference":

"1. The efficient production and use of electrical energy and coal as an energy resource;

2. the effective application and use of the various alternative energy resources, including natural gas, for socio-economic development;

3. The acquisition, distribution and use of transport energy resources;

4. Integrated energy policy planning, in order to ensure cost-effective and sustainable long-term energy availability and consumption for socio-economic development; and

5. The management of an investigation and demonstration programme in support of energy policy" (Department of Mineral and Energy Affairs Annual Report 1993:53).

The list is notable for its reversion to a set of energy policy goals espoused in the mid-1980s, with a few differences: a subtle shift from energy resources to the energy industry (electricity and coal), the replacement of 'economic development" by "socio-economic development", the replacement of "liquid fuels" by "transport energy"[29], the ever-hopeful commitment to energy planning, and the addition of the last point to cater for the remnants of the NEC's research programme. In conclusion, the NEC represented a concerted attempt to develop an energy policy framework outside of the apartheid-era energy policy paradigm, and more importantly, outside

[29] 'transport energy' denotes a demand-side approach to the oil problem (which would include a range of non-liquid fuels supply solutions), but here it is expressed in a supply-side way (which would not).

of the orthodox apartheid-era bureaucracy, but without the kind of political support which had characterised earlier energy policy developments, either from government or from stakeholders.

5) 1993 to 1998

As mentioned above, the process of transition to a post-apartheid political order was initiated in 1990, and culminated, via a lengthy negotiation process (Codesa), in elections in 1994, which resulted in a 'Government of National Unity' (GNU). The structure of the GNU was based on a proportional representation system in which the party or coalition with a majority of seats would form a government, but be obliged to allocate Cabinet posts to opposition parties, based on their representation in parliament. The GNU would then be replaced in 1999 by a new government elected under a new constitution finalised by a Constituent Assembly based on the 1994 parliament. Since the apartheid-era ruling party, the National Party, won the second-largest number of seats, the ANC, which won the election by a large majority, allocated to them one of two Vice-President positions, as well as a number of Cabinet posts. The National Party withdrew from the GNU in 1996 and the allocated Cabinet seats were reallocated to the ANC and other opposition parties. The transitional arrangements also included a 'sunset clause' whereby civil servants would be maintained in their line functions by the new government, which restricted the post-apartheid state's ability to transform the civil service.

The end of apartheid and the transitional process had several important effects on energy policy processes. The first was the removal of the strategic imperative, which, as discussed above, resulted in the decline of political attention and patronage, and the resulting demotion of the energy policy bureaucracy in the civil service: in addition, the 'special relationship' between the state and the nuclear establishment was terminated with the termination of the weapons programme and the redundancy of the fuel cycle, and the oil security strategy was scaled down. The second important effect was the marginalisation of the energy bureaucracy during a period from 1993 to 1996. There were several reasons for this: the first was a general outcome of the negotiation process, which shifted policy-making from government departments into the negotiating process; the second was the close association between apartheid and energy policy via the oil embargo and nuclear weapons programmes, which called the legitimacy of the DMEA further into question; and the third was the result of the inability (politically and otherwise) to develop a post-apartheid energy policy framework. Partly as a result of these factors, major policy initiatives during the transition were negotiated outside the state's policy system, in transitional fora such as the National Electrification Forum, the Liquid Fuels Industry Task Force and the Nuclear Fuel Cycle Initiative. Particularly in the case of the first two, these were

revolutionary processes in a South African context, since for the first time stakeholders outside the white political and economic elite were involved in energy policy decision-making.

This pattern was continued after the 1994 elections: an important role in energy policy-making was played by the Parliamentary Portfolio Committee on Minerals and Energy, particularly in promoting the formulation of a post-apartheid energy policy framework. The reason for this was that the Minerals and Energy portfolio was allocated to the National Party in 1994; thus, the imperative for both policy and institutional reform did not come from the Minister. After the NP withdrew from the GNU in 1996, an ANC Minister was appointed, and a process of restructuring set in motion within the DMEA; ironically, this change in leadership resulted in another delay in the finalisation of a post-apartheid energy policy framework, contained in the 1998 Energy Policy White Paper, as the new leadership took some time to establish ownership of the policy process: the change in leadership in the DMEA also had a considerable impact on policy priorities, which will be discussed in more detail below.

Negotiation and Reform: the DMEA and the Transitional Process

The structure of the reformed Energy Chief Directorate in the DMEA bore a superficial resemblance to the structure of the NEC; however in reality, it represented a return to the supply-side structure of the mid-1980s, with the exception of the 'energy for development' section, and a continuing research programme focused on the activities below, which was largely terminated in 1996. The focus of the new structure was on three activities, to which corresponded three Directorates: liquid fuels policy, electricity and coal, and 'energy for development'. Administrative and regulatory functions were divided between the first two of these: ironically, the transition process, and the entry of Eskom into electrification, had rekindled interest in central government in the parameters of electricity policy (see Chapter 4). The 'transport energy' Directorate, which had begun to develop a broader demand-side perspective under the NEC, and had not been the organisational site for the regulation of the liquid fuels industry, took over these functions, which became its primary responsibility. The 'energy for development' Directorate, the only programme to have survived intact from the NEC, grew substantially in the new environment. Energy planning, despite continued commitments to the process, was not undertaken by the Energy Chief Directorate, ostensibly on account of a lack of skills: the 1994 Annual Report noted that these skills deficiencies meant that

> "..no technical staff were available for energy statistics, energy data base development, energy-economic analysis, energy modelling and scenario development.." (Department of Mineral and Energy Affairs Annual Report 1994:30).

This skills shortage was not remedied, and integrated energy planning was not undertaken by the DMEA until the end of the century, when it was outsourced to the ERI. The institutional culture

of the Energy Chief Directorate was significantly influenced by the research-based culture of the new leadership, including Johann Basson, the new chief energy bureaucrat, who before the creation of the NEC had been in the NPER rather than in the DMEA's pre-1987 Energy Branch, and policy processes were conceived in a very technocratic fashion, which significantly affected the DMEA's approach to the Green and White Paper processes.

However, during the transition, the DMEA was displaced from its formal policy-making role. Policy-making during the transitional period was different from that of other periods in one very important respect: a fundamental element of public policy is that it is legitimated through a process of endorsement by an appropriate state agency, whereas during the transition it became politically costly for the apartheid state to perform this legitimation function unilaterally. Legitimacy crises in specific policy domains developed separately, and were sparked by a series of policy crises during the transition; for example, the 1993 policy crisis beginning with the petrol price increase, and progressing to the whole liquid fuels regulatory system, marked an abrupt historical point at which the apartheid state (in the form of the DMEA) was no longer able to unilaterally make or sustain liquid fuels policy without provoking a political crisis. In the same way, the legitimation function of state agencies (and on a more detailed level, specific policy functions) were not restored *en masse* after the 1994 elections, but in a piecemeal fashion as state agencies were integrated into the post-apartheid state. Processes of integration varied in specific cases, but generally these involved some form of leadership change (organisational ownership), from apartheid leadership to post-apartheid leadership[30], combined with the development by the new political elite of specific policy interests (policy ownership)[31], which together comprised a process which can best be described as 'taking ownership' by the new leadership.

Thus, what developed in place of the legitimation function of state agencies during the transition was a set of temporary institutions which specified the conditions for establishing policy

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[30] The essence of the apartheid civil service leadership was defined in two ways: elite officials were usually part of elite political networks, but both elite officials and the middle and lower ranks were defined politically not in terms of their ideological zeal for apartheid, but in terms of their lack of dissent. Thus, many apartheid-era officials were not apartheid ideologues but merely technocrats, who were able to function effectively in the post-1994 state. The essence of 'post-apartheid leadership' is difficult to define. Two processes were simultaneously in operation, which overlapped considerably: first, the new government swiftly adopted affirmative action programmes, which sought to replace an entirely white leadership in state agencies with a largely black leadership (the aim being to redress apartheid discrimination and to reflect the demographic composition of the general population); and second, apartheid-era leadership (which was largely linked to the apartheid-era National Party) was replaced by a new leadership who were broadly sympathetic to the new order. Much of the new leadership was well-connected with the leadership of the ANC, which facilitated co-ordination with the executive in developing new policies and institutions (both because of common membership of elite networks, as well as an outcome of a shared set of goals and values). State agencies without a new leadership did not have this advantage, and transformation in these was generally very slow until a leadership change occurred. Another factor was the authoritarian culture of the apartheid civil service, which severely discouraged dissent of any kind; this was largely replaced by a more open organisational culture after 1994.

[31] One of the problems of the transition was that the ANC simply had no interest in many policy issues, which was to be expected, given the scope of their resources before 1994. Thus, in the run-up to the elections, new policies were only formulated in areas which were particularly important to their constituency (had been politicised in some way), or were particularly relevant or interesting to individual policy analysts in the ANC; other policy stances were only developed by the new government over a period of a decade following the transition, as the influence of the new government was gradually extended throughout the state.

legitimation. These primarily involved processes of consultation, the scope of which was specified by a blend of pragmatic and normative considerations. The former were dictated by the *realpolitik* of the negotiation process, and specified participation of a minimum of only two actors[32]: a group with a plausible mandate from the ANC (which provided political legitimacy), and the relevant state agency or stakeholder (which was able to implement the policy). The latter was based on an ethic of democratisation, which specified broad participation, particularly from previously excluded constituencies[33]. These considerations were mediated by the negotiation process itself, which provided a number of generalised frameworks and procedures for 'legitimate' consultation processes. Because of the undefined structure of the process, actors who were not usually centrally involved in the policy process could play central roles during the transition, but were generally marginalised afterwards.

In the case of energy policy institutions, the displacement of energy policy processes from the DMEA occurred in 1992 and 1993 with the launch of the LFITF and the NELF, and continued for the Green and White Paper processes: the end of the transitional process did not occur with the election of the new government in 1994, but was delayed by the appointment of a Nationalist minister; energy policy processes moved back into a formal context (the DMEA/DME). During this period, the key factor was the way in which the ANC was represented in the process. At the beginning of the 1990s, the ANC did not have a detailed position on key energy policy issues, other than a general sense that the apartheid-era energy complex should be dismantled. The party progressively developed a more detailed policy position in three phases. Phase one began in 1992 with the ANC Electrification Conference, and ended with the installation of the new government in 1994, but a non-ANC minister. Phase 2 began in 1994, and ended with the collapse of the GNU in 1996 and the appointment of an ANC minister, and phase 3 began in 1996 and ended in 1998 with the tabling of the Energy Policy White Paper. During these phases, the ANC's policy positions were represented and defined differently by several groups.

The first two groups can best be referred to as 'energy policy activists'[34], and consisted of energy policy researchers and political activists associated with the EDRC, trade unions, and NGOs

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[32] Many processes involved more than two actors, but an example of a key decision involving only the minimum was the accelerated electrification programme: the final decision (which established the 5-year target) was developed in a large forum (NELF), but made by only Eskom and the ANC (via a small group of energy policy activists), before the 1994 elections, without reference to the DMEA or the government.

[33] The problem with the latter approach was that there were limits to 'universal participation' in policy processes, imposed by organisational constraints. For instance, at the 1995 Energy Policy Summit (see below), there was a demand from policy activists for 'community participation', but the problem of how the 'community' would participate was not easily solved, and consisted of two elements: first, how the 'community' would be represented, and second, the development of sufficient knowledge and expertise in energy policy issues to be able to represent 'community' interests in the process meaningfully. These problems were not sufficiently addressed, and the concerns of poor communities in the Summit were largely represented by policy researchers, rather than by political representatives. The same problem has persisted, as poor communities have not had a systematic or sustained presence in energy policy processes since 1994, despite the high status of energy poverty on the ANC's policy agenda.

[34] 'Energy policy activists' fulfilled a similar role in this context to Kingdon's 'policy entrepeneurs', in that their primary commitment in participating in the policy process was a specific policy agenda stemming from their professional concerns rather than political interests (although individuals did in fact have deeply-held political convictions).

working in energy poverty-related fields, and with an ANC affiliation. The first group consisted of energy policy researchers from the EDRC, which began to play an activist role in energy policy processes in NELF (electrification); this was expanded through the EPRET project into a more general concern with *energy policy per se* based on a demand-side perspective heavily influenced by the EDRC's work on energy poverty. Their approach was strongly rationalist, and the role that this group adopted, although in a novel context (the political transition) with unique features, was part of a historical pattern of 'energy policy advocates' beginning in the 1970s. For ease of reference, this group will be referred to as 'EDRC policy activists', since almost all of them spent a formative period in the EDRC (although some moved into other organisational contexts later in the transition).

The second group consisted of trade unionists and ANC activists, who developed their policy positions in the context of the ANC's broader economic policies, as well as in specific energy supply sectors within which unions organised (electricity, liquid fuels), in relation to which policy proposals were developed, and will be referred to as 'ANC policy activists' for convenience. The influence of the latter group on policy outcomes was more pervasive in the long term: the identity of its members was primarily as political activists (either in the ANC or the unions) rather than policy activists, and they thus formed part of an ANC political network from which the EDRC researchers were largely excluded. Their primary interest, which coincided better with the new government's political priorities, was in developing ANC policy positions on, and asserting influence over, the energy supply industries (in particular the liquid fuels industry), whereas the EDRC policy activists envisaged a new energy policy paradigm. The ANC's leadership for various reasons came to share the vision of the ANC policy activists more closely; thus many of the non-EDRC activists were appointed to leadership positions in the post-apartheid minerals and energy policy bureaucracy, whereas none of the EDRC policy activists were appointed to positions in the DMEA, and very few to other institutions[35].

The third group was the Parliamentary Portfolio Committee[36] on Minerals and Energy, which came into existence after the 1994 elections as a result of a post-apartheid reform of the parliamentary system, was chaired by an ANC MP, and played what was for a parliamentary committee an unusually activist role (IEA 1996b:66-67). The fourth group was the ANC's

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[35] The sources for this section, the history of which has not been documented, are contained in Chapters 4,5 and 6; in addition, a more important source was participant observation, both in the EDRC and in the ANC's parliamentary research unit, from 1997 to 2002.

[36] The apartheid-era parliament had also had a committee system, but it did not play a significant role in policy or oversight, and was also very limited in its scope. By contrast, the committee system plays a prominent role in the new parliamentary system: each ministerial portfolio (which correspond in most cases to a government department) has a corresponding Portfolio Committee in parliament, which process legislation in their areas (including the holding of public hearings) before it reaches the National Assembly, as well as performing an oversight function of government and policy in their areas.

Minerals and Energy Group (MEG), which was initiated in the early 1990s as a policy forum within the organisation.

The way in which the ANC's policy position was defined and represented evolved considerably in the three phases outlined above. During phase 1, energy policy activity was concentrated in the two negotiating fora, the NELF and the LFITF (and to a lesser extent, the NFCI). Whereas in the LFITF, the influence of ANC policy activists predominated, in the NELF, EDRC policy activists predominated, and had a dominant influence on the ANC's MEG, which oversaw the drafting of the ANC's two main policy statements in 1994: the Draft Minerals and Energy Policy Document (African National Congress 1994a) and the Reconstruction and Development Programme (African National Congress 1994b), which served as a general policy framework for the new government and contained a significant section on energy policy built around electrification. The RDP's energy section was drafted by EDRC policy activists, who had lobbied the ANC's drafting committee for its inclusion. In the second phase, the PPC, in close association with the EDRC policy activists, played a significant role in pressurising a reluctant Minister and DMEA to embark on the development of an Energy Policy White Paper; the MEG continued to play an important role in the ANC as a forum in what was now the governing party. However, the pattern changed considerably in the third phase, which began with the appointment of an ANC Minister of Minerals and Energy, who began a process of replacing the leadership of the DMEA. The PPC reverted to a more orthodox role, and the MEG stopped meeting around 1997; attempts to revive it were made in 2001, but did not succeed. Some ANC policy activists were appointed to leadership positions in the DMEA and other associated institutions, and the influence of EDRC policy activists declined sharply. Whereas the latter had been seen as "ANC resource people" (Interview with A Eberhard) in phases 1 and 2, as the ANC took ownership of the DMEA, they were increasingly marginalised, whereas the more pragmatic but less programmatic ANC policy activists became more influential. This was partly a symptom of a transfer of policy-making from the party to government, and had significant impacts on what kind of approach to energy policy the new government pursued.

During this period, the internal structure of the DMEA remained the same until a restructuring process was initiated by the appointment of an ANC Minister in 1996. In 1997, the Energy Chief Directorate was again elevated one level to a Branch, the DMEA was 'rebranded' as the Department of Minerals and Energy (DME) with a new logo and the slogan "Minerals and Energy for Development and Prosperity" (Department of Minerals and Energy Annual Report 1997:ii), and a demographic transformation programme was initiated (in 1996, the DME consisted almost entirely of white staff). Most of the apartheid-era senior leadership of the

Energy Branch retired, and were replaced by new staff more aligned (and better connected) with the new order.

During the same period, the DME underwent another internal restructuring period, which reflected the relative importance attached to specific policy activities. The 1993 internal structure was maintained until 1998, when the Energy Branch was structured into three new sections: a liquid fuels section, a 'demand and non-grid' section (which included the non-grid electrification programme, renewable energy and 'demand for energy'), and an 'energy supply' section, which included electricity and coal policy. The electrification programme, probably the most important energy policy initiative of the 1990s, was at this stage still based outside the DME. The restructuring process was unfinished at this point, and was only concluded in 2002, with a strong emphasis on the energy supply industry, and limited capacity dedicated to demand-side and other issues. During this period, the organisation underwent another significant shift in institutional culture: the 1993 leadership were largely from a research background (via the NPER and the NEC), most of whom had not spent any part of their careers in the orthodox civil service, and had a strongly technocratic approach to policy-making, whereas the new leadership were more at home in the new political environment and better versed in the political aspects of policymaking, but lacked experience, and were thus dependent on the existing framework of relationships with stakeholders in policy processes, which was an impediment to significant policy change.

Policy Developments During the Transition

Against this background, the transition was characterised by two overlapping phases of policy activity. The first, from around 1992 to 1995, began with the policy fora, and culminated with their dissolution in 1995. During this phase, aside from the policy landmarks in the LFITF and NELF (which have been thoroughly discussed in Chapters 4 to 6), the boundaries of the energy policy domain underwent considerable transformation, and a new and politically-relevant focus for energy policy developed in the form of energy poverty. The confluence of this development and the debates in the fora led by 1994 to the articulation of a set of general energy policy principles by the ANC. This was the starting point of the second phase, which consisted of the formalisation of this process in the development of a post-apartheid energy policy framework in the form of the 1998 White Paper. The process began in 1994, and culminated with the tabling of the final document in parliament in December 1998. During this phase, the other crucial development was the appointment of an ANC Minister of Minerals and Energy, who set in motion a process of transformation of state energy institutions, including the DMEA.

The first phase was inaugurated by the 1992 ANC electrification conference, orchestrated by the EDRC, which was the beginning of both the ANC's substantive engagement with energy policy

issues and the EDRC policy activists' central role in transitional policy processes, and was followed in 1993 by the second major policy crisis of the transition, which led to the establishment of the LFITF. Without recourse to historical subtleties, these two fora epitomised two different modes of engagement with energy policy by the ANC and its allies: the EDRC *policy activists'* role in NELF was premised on their energy poverty-based approach to energy policy, and provided an impetus for significant institutional reform, whereas the unionists' role in the LFITF, epitomised by Dr Rod Crompton, later chief liquid fuels bureaucrat in the DME, was geared towards accommodation with, control of, and ultimately reform of, the existing system: the ANC's approach to energy policy was an uneasy synthesis of these two approaches. Politically, and certainly rhetorically, the first approach was more important in the first phase of the transition.

The EDRC had managed to unite a number of critiques of the apartheid energy policy paradigm in their research into energy poverty[37]. The concept of 'energy poverty' emerged in the developing world in the late 1970s and early 1980s, both as a corrective to approaches to energy policy developed in industrialised countries, and also as a way of linking poverty and development issues to energy policy. Energy poverty in its narrowest sense can be defined as a lack of energy services vital to basic human needs, which would include cooking and heating. In practice, it is defined in a broader sense to include a host of problems associated with the intersection between energy use and poverty, including the negative effects on households of energy sources such as wood, paraffin and coal (respiratory disease, loss of labour time, chemical pneumonia caused by accidental ingestion of paraffin, burn injuries and loss of property through fires, loss of forestry resources, etc). These problems can be addressed through overcoming problems of access to energy supply (paradigm 1), a mix of supply and demand solutions, including for instance better insulated houses (paradigm 2), or more complex and sophisticated measures which take into account issues such as social and gender relationships within and between households (paradigm 3).

In South Africa, the existence of energy poverty was, and still is, widespread, as it is in many developing countries, with the distinction that due to apartheid it was not problematised for far longer. Aside from the militant neglect of the welfare of 'black' households as well as their exclusion from the economy, apartheid discourse naturalised poverty as being appropriate to 'pre-modern' communities. In addition to this, the supply-side framework dominant in apartheid-era energy policy in the 1970s and 1980s did not accommodate a concern for household energy

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[37] While the EDRC was certainly not alone in developing or advocating this approach, it was by far the most significant in two ways: first, EDRC researchers (particularly the founding Director, Dr Anton Eberhard) had pioneered energy poverty research in South Africa in the mid-1980s, and second, and most importantly, the EDRC had been able to translate their research activities successfully into a policy context.

needs; where a need for electricity was expressed politically[38], this was the province of either Eskom or local authorities, and the only instances of electrification outside of the boundaries of the orthodox electricity market was the subsidised electrification of white farm households for political and strategic purposes. As mentioned above, research into the energy requirements of rural communities was inaugurated in the state in the mid-1980s, via funding of university-based research units by the NPER[39], but without any consequences for policy.

The most important of these research units, the EDRC, made a fundamental transition from a technical/development focus to a policy focus in 1991, with a concomitant shift of the organisation's primary focus from the energy needs of poor rural communities to electrification, and specifically urban electrification, which was placed in a broader context of energy demand in poor communities. The shift from rural development to electrification was a shift from a relatively policy-neutral area neglected by the apartheid state, to a 'dense policy space' occupied by various levels of government. The 1992 ANC Conference on Electrification, which was orchestrated by the leadership of the EDRC, was a watershed in that it signalled the beginning of a co-operative relationship between ANC-aligned energy policy activists and Eskom:

> "..in terms of the state energy sector.. [electrification] was the first real crack where the disjuncture between what the state had set up as its energy policy, its concentration on security of supply; the disjuncture between that and the real needs of the population began to show; an institution within that whole group of energy supply institutions began to question its role. So it was a very important area." (Interview with M Pickering, EDRC researcher).

The open alignment of the organisation with the ANC also led to the termination of the DMEA's funding (after 3 years instead of 5). At the same time, however, this alignment transformed the EDRC's role from one limited to 'energy and development' issues to a key actor in the transitional debates on a post-apartheid energy policy and institutional framework. The EDRC's focus on energy poverty was expanded into a more general policy framework through the Energy Policy Research and Training Project (EPRET) from 1992 to 1994, as well as involvement in a number of other policy-related initiatives, including the ANC-backed Macro-Economic Research Group in 1993 and 1994. The primary objective of EPRET was, in the words of the EDRC's director:

> "..to raise to the fore of energy policy issues our traditional areas of concern, that of widening access to energy services for the poor, urban poor, rural poor." (Interview with A Eberhard).

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[38] This was only done effectively by white South Africans at the time; political expression by other South Africans was discouraged violently at the time.

[39] Much research on energy poverty was done by Eberhard and others during the 1980s, with and without state funding: the first research on rural energy demand was Eberhard (1986), and on urban demand Eberhard (1984).

The EPRET project covered a wide range of policy topics, including integrated energy planning, energy demand in poor households, integrated energy provision for rural households, and energy efficiency, environment, transport, and electricity distribution and pricing for poor households (EDRC 1994), and the research which originated in the project played a significant role in the establishment of Eskom's 1994 electrification target, which was included in the ANC's RDP.

The broad framework developed in the EPRET project was derived from other developing country energy analysts such as Munashinge (1990), and emphasised an integrated demand-side approach to both energy poverty and energy policy in general, which established a strong case for significant institutional reform, focused in the inadequacy of the state energy policy bureaucracy, which did not have the capacity to undertake the kind of demand-side policies which this approach required. This dovetailed with political sentiments expressed at the time by the ANC, unions and other anti-apartheid groups that the secretive institutions of the apartheid-era energy complex were a) not sufficiently (or at all) accountable to the public, and b) not adequate to address 'legitimate' energy policy problems (i.e. not those of the apartheid state). This *general* impetus for institutional reform during the transition was thus most often framed in the language of democratisation (which obviously enjoyed a wide consensus), which masked an important distinction between two kinds of institutional reform proposed during and after the transition, which can be termed 'hard' and 'soft' reforms. Whereas the latter primarily involved 'normalising' apartheid-era governance arrangements regarding the energy system[40], the former involved a more fundamental reorganisation of the state energy policy bureaucracy. Support for soft reforms was continuous and successful during and after the transition, and resulted in the establishment of several regulators (electricity, nuclear safety, pipelines, natural gas), as well as the restructuring of the state's liquid fuels assets and operations and the formalisation of the liquid fuels regulatory system. Support for hard reforms was linked, as discussed above, to the support for a specific approach to energy policy, which was particularly strong in the mid-1990s, and was clearly expressed in the White Paper, but not sustained beyond that.

The fading of this support, and the factors involved, is illustrated by the transformation in the mid 1990s of energy poverty policy into electrification policy; while the EDRC emphasised an integrated approach to energy poverty, to address a host of complex problems including health, fuelwood depletion, affordability and energy-efficient appliances and houses, the only area in which these were successfully translated into effective policy was in electrification. During the transition, the DMEA funded a wide variety of studies by the EDRC and others into various aspects of energy poverty, but no other major programmes were forthcoming. There were several

[40] This implies maintaining the basic regulatory framework, but reforming the policymaking and regulatory machinery underpinning it.

reasons for this. The first was a conceptual one: the EDRC itself understood electrification as "..the core of South Africa's household energy policy.." (Eberhard & Van Horen 1995:vii), which was partly responsible for the neglect of other supply options common in almost all other developing countries such as LPG. The second was the lack of institutional capacity in the DMEA to pursue any household energy strategy (since the electrification programme was largely co-ordinated by Eskom, which had the technical, financial and organisational resources), and the unwillingness to create such a capacity. The third, and probably most decisive reason, was the success with which the electrification programme had been negotiated. The group of energy policy activists involved in the negotiations were also influenced at the time by the receptivity of both major stakeholders (primarily Eskom) and the ANC to energy policy advocacy:

> "..there was a massive window which was completely open for changing policy, for actually writing policy, so all the research that we were doing, fortunately because of political connections, fed straight into the RDP; basically we wrote the RDP, two or three pages on energy, and there were two reasons we were able to do that: one was that we had done some work and we knew something about it, I wouldn't say a huge amount, but more than anybody else, and secondly, we had political connections.. ..politically we were in the right place at the right time. Without either of those it wouldn't have been there.. ..It was very unorthodox in research terms. That was what made South Africa so fascinating at the time; it was a clean slate.." (Interview with C Van Horen, EDRC researcher).

The concept of a 'clean slate' was in fact an illusion; for most of the transition, there was in fact a significant 'policy vacuum' in terms of the broad parameters of a post-apartheid energy policy framework, but underlying this, there were well-established (and only temporarily interrupted) policy trajectories which began to reassert themselves towards the end of the transition. As the passage above outlines, the EDRC policy activists were very successful in influencing key policy documents in the mid-1990s such as the ANC's Reconstruction and Development Programme.

The most significant policy expression of this approach was in the ANC's Reconstruction and Development Programme, which was "an integrated, coherent socio-economic policy framework" to guide policy formulation by the new government (Reconstruction and Development Programme 1994:1.1.1)[41]. Energy policy proposals were contained in the "Meeting Basic Needs" section, rather than in the more traditional context for energy policy (the economic policy category, titled "Building the Economy" in the RDP), and were based on three main principles. The first was a statement of general principle for a new energy policy framework:

> "Past South African energy policies concentrated on achieving energy self-sufficiency at enormous cost (such as the Mossgas project), but seriously neglected the household sector.

[41] The Reconstruction and Development Programme document referred to here is the ANC's Reconstruction and Development Programme 'Base Document', rather than the later RDP White Paper, a government publication – references are by section.

> Future energy policy must concentrate on the provision of energy services to meet the basic needs of poor households, stimulate productive capacity and urgently meet the energy needs associated with community services such as schools, clinics and water supplies. Energy policies must be developed on the basis of an integration of supply-side and demand-side considerations" (African National Congress 1994b:2.7.3).

The second was a specific set of proposals and targets for the electrification programme, which was the outcome of negotiation between energy policy activists and Eskom, and the third was the proposal that an Energy Policy Council be established to make energy policy, modelled on NELF and involving a wide range of stakeholders (African National Congress 1994b:2.7.7-2.7.9)[42]. This was echoed a short while later in a proposal in the Green Paper (1995), which proposed a national energy policy forum with its own staff, which would potentially

> "..facilitate the integration of the National Electrification Forum (NELF), the National Economic Forum's Liquid Fuels Industry Task Force (LFITF) and various other energy related forums into an integrated energy planning framework.." (1995 Energy Policy Discussion Document: Section 2.6).

This represented a turning point politically for energy policy processes in the transition, since it represented the high point of a widespread commitment to what the IEA's report described as "off-campus" policymaking, i.e. outside of formal government structures (IEA 1996b:70). In addition, it represented the peak in influence of what might be termed 'grand energy policy' during the transition: in other words, visions of introducing large-scale reforms which would in effect rebuild the energy policy system from the ground up, a project which was given credence by the EDRC's view of the energy policy domain as a 'clean slate'[43]. However, interest in 'grand energy policy' debates waned as major stakeholders began establishing relationships with the new government, and what had been a broad energy policy issue network during the transition collapsed as the transition drew to a close. From 1996, effort by the ANC, now the new government, was diverted from creating quasi-governmental consultative institutions to oversee energy policymaking, to establishing control of energy supply sector policy processes and to reforming the existing energy institutions in government.

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[42] This proposal was elaborated in a comprehensive and detailed form in a paper by Eberhard (1995), whereby a National Energy Policy Council would provide input from stakeholders and experts to the DMEA, which would remain the main policy agency.

[43] The last attempt that the EDRC made in the 'grand energy policy' vein was an 'Energy Policy Colloquium' in late 1997, a closed 2-day workshop to which the most senior representatives of the energy sector were invited, including the CEOs of oil and other energy sector companies, the senior bureaucrats of the DME, trade unionists, MPs and others, in the vein of other energy policy fora during the transition. The aim of the event was to create momentum in the stalled White Paper process, and the first blow to the event was the failure of the Minister to attend. It became apparent however that major stakeholders had begun to build relationships with the new political leadership outside the transitional fora, and no longer considered them necessary. The outcome of the meeting was inconclusive, and it turned out to be the last in what was intended to be a series of 'Chatham House'-type meetings of energy policy stakeholders to build consensus for a post-apartheid energy policy framework, and also a sign of the coming marginalisation of the EDRC policy activists in energy policy processes.

The second phase of policy development during the transition was the development of the 1998 Energy Policy White Paper, which was preceded by an 'Energy Policy Discussion Document' (Green Paper)[44], published in 1995. The idea of an Energy Policy Discussion Document was raised by the EDRC with the DMEA in 1994, and the impetus to develop a White Paper came from the Parliamentary Portfolio Committee, with which the EDRC policy activists had developed a close relationship. In 1995, in a reversal of orthodox policy roles, the chairperson of the PPC called the leadership of both the Energy Chief Directorate and the DMEA into his office and ordered them to initiate a White Paper process, and to task the EDRC with facilitating the process (Interview with A Eberhard).

The drafting process was a synthesis of two different organisational contexts: the DMEA and the EDRC. Interviews with participants revealed a sharply different perception of the nature of the process and the relative value of different contributions: EDRC policy activists saw the White Paper as an abrupt break with the past, and as a fundamentally consultative process in which they played a central facilitative role, whereas DMEA officials saw the White Paper as the culmination of a continuous process of policy analysis begun in the NEC during apartheid, and continued during the transition. The DMEA began the drafting of 13 'synthesis documents', undertaken by outside consultants (because of lack of capacity – Interview with J Basson), the aim of which was to summarise the conclusions of the energy policy research programme begun under the NEC, and in that sense the White Paper was seen by the Energy Chief Directorate's leadership as the culmination of the NEC project, which coincided fortuitously with the requirement for a post-apartheid energy policy framework: in other words, the White Paper process was conceived by the Energy Chief Directorate in almost entirely analytical terms. This was the result of several factors.

The most important one was probably a lack of capacity and experience in policy-making in many areas, which stemmed from two sources. First, the Energy Chief Directorate had not developed capacity to make policy in most areas which were required for a comprehensive post-apartheid energy policy (with its significantly expanded domain): as discussed above, the areas in which the state energy bureaucracy had been involved in policy-making itself were quite limited, as noted in the IEA's 1996 report:

> "Historically, most energy policy making in South Africa has been de facto performed by industry. The large private and parastatal companies that dominate the sector communicated their wishes to the Government in an often informal, non-transparent process. There was also a devolution of policy making authority to various parastatal subsectoral bodies, such as the

[44] The South African Energy Policy Discussion Document was commonly referred to as the 'Energy Green Paper', since it performed the function of a Green Paper, but was not formally designated as such – from now on it is referred to in the text as the Green Paper.

> Electricity Council, which supervises Eskom, and the Central Energy Fund, which looks after subsidies to synthetic fuels, offshore exploration and its regulation, and manages the strategic oil storage. One legacy of past practice is the lack of policymaking capacity within the DMEA. The DMEA is thus understaffed and underskilled for the policy agenda it faces and for undertaking the policy making role" (IEA 1996b:70).

Second, the Energy Chief Directorate's approach was heavily influenced by a research-based institutional culture inherited from the NEC (including both the head of the Energy Chief Directorate and the head of the DMEA), which also influenced their concept of policymaking:

> "DMEA officials appear to be primarily engaged in analysis.. ..while looking to industry, consultants and think tanks for policy formulation" (IEA 1996b:69).

The Energy Chief Directorate's reliance on analysis as a substitute for policymaking was, in addition to the organisation's research-influenced institutional culture, a result of both the historical marginalisation of the energy bureaucracy in important decision-making processes, and a reaction to the political uncertainties of the transition.

This latter factor also played a significant role in the DMEA's analytical understanding of the process: officials found it difficult to function in the new political environment, for two reasons. First, the energy policy domain had changed during the transition, and included a host of new issues and actors, and the long-term relationships which the energy bureaucracy had developed with important stakeholders were only a partial basis for policymaking in the new environment; and second, officials were out of their depth in the new political environment, both in terms of their familiarity with the new political actors and issues which formed a prominent part of it, and also in terms of their experience of consultative political processes. Not only were officials unfamiliar with these latter processes, which formed such an important aspect of transitional politics, but, due to the factors discussed above, were in many instances also inexperienced in the politics of much of the energy sector itself. The difference between officials' conception of the policy process, and that of the energy policy activists is clearly portrayed in this extract from an interview with an EDRC researcher, which also highlights the fact that *policy content* was not the main source of difference:

> "[Senior DMEA officials] were rationalists and did not in any way understand the process side of policy, and when in those early meetings we said 'but there's process and content', they were saying 'process? What's that?'; for them it was a technocratic exercise putting a policy document together. They weren't insensitive to including issues like household energy needs, but had no clue about how to conduct a policy process, and we brought that. I'd spent my life operating in the political realm, really, and it was a very familiar realm for me at the time, but, for people like [them], it was a completely alien and quite terrifying

world, so they became very dependent very quickly on the kind of inputs and connections that we brought.." (Interview with M Pickering, EDRC researcher).

A point which needs to be clarified is that the 'political realm' Pickering was referring to was the broad political environment of the transition, and within that, familiarity with the kinds of open political processes which had developed in the anti-apartheid movement, and which formed an important institutional resource for the transition. DMEA officials were all too familiar with the autocratic political and institutional environment of the apartheid state (Interview with J Basson), and it was the stark contrast between the two environments which left them ill-equipped for the White Paper process. In addition to this, the kind of extensive consultative processes which were so central to policy processes during the transition were a historical phenomenon of short duration; although the post-apartheid state features many institutionalised forms of consultative processes, these processes ceased to have the central importance that they had during the transition (see above).

The 'core project team' for the Green Paper consisted of two senior officials from the DMEA and five researchers from the EDRC, including the editor and project manager (1995 Energy Policy Discussion Document:vii). The document consisted of a structured consideration of key energy policy issues, with a number of competing 'options' for each issue in an attempt to represent the range of views on specific policy issues then current. The structure of the document is an indication of a significant shift in the conceptual framework of energy policy deliberation; in addition to the usual supply sectors, there is a detailed section on governance of the energy system, and sections on "cross-cutting themes", including health, environment, energy efficiency and human resource development (1995 Energy Policy Discussion Document: xi).

The White Paper process, which was initiated in 1995, included an "Energy Policy Summit" in late 1995, to which a very wide range of stakeholders were invited. The process was stalled in 1996, when an ANC Minister of Minerals and Energy was appointed to replace Pik Botha, the Nationalist minister who retired when the Nationalist Party withdrew from the Government of National Unity. The appointment of an ANC minister also heralded a process of leadership change within the DMEA as the apartheid-era leadership was replaced by a new generation of civil servants, many of whom were aligned more closely with the policy aims of the new government. The final White Paper was tabled in 1998.

Key policy objectives listed in the White Paper were increasing access to affordable energy services, improving energy governance, stimulating economic development, managing energy-related environmental and health impacts, and securing supply through diversity (1998 Energy Policy White Paper:ix). Specific policies are elaborated in three sections, which deal with demand sectors, supply sectors and 'cross-cutting issues'; these latter issues included integrated

energy planning, energy efficiency, statistics and information, environment, health and safety, research and development, human resources, capacity building, education, and information dissemination (1998 Energy Policy White Paper:xv). The most notable characteristic of the White Paper is that it contains strong commitments to a demand-side approach to energy policy, with a strong emphasis on integrated energy planning, energy efficiency and the mitigation of environmental impacts.

In terms of substantive policy issues, there are four areas which are notable. The first is household energy, or more specifically, the provision of affordable energy services for the poor, which outlines a programme of providing a variety of affordable and safe energy services to poor households in different contexts. The second is the emphasis on process and capacity within the DME, which emphasises a) the use of 'integrated energy planning', and b) the appropriate level of skills and capacity to be able to set up a functional policy system. The third and fourth areas of policy which are notable are the supply sectors relating to electricity and liquid fuels. These are interesting on account of the significant changes in these two sections between the first confidential draft in 1996 (1996 Draft Energy Policy White Paper) and the final draft in 1998 which makes them stand out from the White Paper in general, the rest of which went through marginal changes.

The electricity section contains far more concrete proposals for restructuring both the supply and distribution sectors, and creating a competitive electricity market. The liquid fuels section contains a number of new items. The general framework for the draft was a non-specific commitment to long-term phased deregulation. The framework in the final version is much more detailed and specific, and includes a strong commitment to deregulation, a commitment to black economic empowerment as a condition for deregulation (entirely absent in the first draft), and a commitment to promoting the development of a 'refining and petrochemicals hub'. The deregulation process is explained in a series of 'milestones', which hinge on "the sustainable presence, ownership or control by historically disadvantaged South Africans of approximately a quarter of all facets of the liquid fuels industry" (1998 Energy Policy White Paper:61), as well as various transition arrangements relating to synthetic fuels, the retail sector and regulatory frameworks.

6) 1999 to 2003

Following the White Paper, the DME was reorganised over a period of several years into its current structure, which consists of two branches, an Electricity and Nuclear branch, and a Hydrocarbons branch, both headed by a Deputy Director General. The Electricity and Nuclear Branch consists of an Electricity Chief Directorate and a Nuclear Chief Directorate. The latter

deals with nuclear safety, nuclear technology, and nuclear non-proliferation, while the former deals with electricity policy analysis and regulation, electricity supply, electrification, and houses the Integrated National Electrification Programme. The Hydrocarbons Directorate contains the Energy Planning Chief Directorate and the Hydrocarbons Chief Directorate. The latter contains directorates in coal and gas, petroleum policy and petroleum and gas regulation. The former contains directorates in environment and energy efficiency, database and administration, and renewable energy. In terms of the White Paper, restructuring processes have been stalled in the liquid fuels industry and the electricity distribution industry, and indefinitely deferred in the electricity supply industry.

There have been two main developments in the post-white paper institutional environment. The first is a series of changes in the structure of the department and its associated institutions, and the second is a proliferation of regulatory agencies, which represents a fundamental shift in the governance culture of the energy system in the wake of the transition from apartheid.

New regulatory agencies have been established in electricity (1994), natural gas (2001), upstream petroleum and gas (2000), nuclear safety (1999), and petroleum pipelines (2003). In addition, the Petroleum Products Amendment Act (2004) formalises the regulation of the retail liquid fuels industry, which will in terms of the Act be handled by the DME. The current intention is to create a consolidated Energy Regulator, which will amalgamate electricity, gas and pipelines regulation, and eventually liquid fuels regulation. The upstream petroleum regulator and the nuclear safety regulator will remain autonomous, since their regulatory functions are not synonymous with economic regulation. Other notable changes include the restructuring of the CEF, and the formation of the state oil company PetroSA, and the restructuring of the AEC and its 'rebranding' in 1999 as the Nuclear Energy Corporation of South Africa (NECSA).

Another significant development since 1994 is the establishment of an effective competition regulatory system in the form of the Competition Commission and the Competition Tribunal, which were established in terms of new competition legislation in 1998. The Commission has shown considerable interest in the non-competitive aspects of the liquid fuels industry, completed one investigation into the retail sector of the liquid fuels industry (the Ratplan), and declared the Sasol Supply Agreement illegal in terms of post-1994 competition legislation. The agreement is due to expire shortly, and in the meantime, the oil industry has applied to the Commission for a temporary exemption.

With these developments, the post-apartheid state has almost completed the reform of apartheid-era energy institutions specified in the White Paper, which is a very significant achievement; however, the more significant changes to the policy framework, such as developing a demand-

side approach to energy policy (including demand-side policies to address household energy and transport energy problems, and to promote energy efficiency) have been severely neglected, for a variety of reasons. One of the curious outcomes of the restructuring process undertaken since 1996 was that the 'energy for development' section of the Energy Chief Directorate, which commissioned ground-breaking research before 1996 into household energy issues, was shut down in a 1997 reorganisation, as were other potential demand-side programmes, as part of a restructuring process. The new structure of the DME has elevated the energy bureaucracy to its most senior level since the NEC, but the internal structure of the energy bureaucracy is built once again around the energy sector, with the exception of a small section of the Department dedicated to a massive range of functions, including renewable energy, energy efficiency, integrated energy planning, and energy/environment issues: although there have been promising policy developments in these areas, no effective policy measures have been forthcoming. An exception is perhaps integrated energy planning, which was successfully outsourced to a resurgent ERI (now merged with the EDRC into the Energy Research Centre (ERC)); however, the impressive Integrated Energy Plan (released in 2003) does not play a significant role in policy decisions.

Conclusion

The development of energy policy activities in government was significantly influenced by three factors: the periodical occurrence of various policy crises, the structure and activities of existing policy communities, and the various institutional contexts within which these functions developed. Policy crises played an extremely significant role in generating support for various energy policy initiatives, and because of this important role, significantly influenced the scope of the energy policy domain. The first was the coal policy crisis of the early 1970s, which laid the foundations for an integrated approach to energy supply policy through the coal issue; this was followed by the 1973 oil crisis, which was seminal in creating the political impetus for the establishment of energy policy institutions. The third crisis was the 1979 oil crisis, which, with other factors, led to a reorganisation of the state's energy supply-related institutions into a centralised department, and had a prolonged effect on the South African economy, culminating in the precipitous decline of the rand against the dollar in 1985, which led to another mini-oil crisis as the oil price in rands rose precipitously. This 'focusing event' played a vital role in creating the political support required for the apartheid state's most grandiose energy policy project, the NEC.

The final, and prolonged, policy crisis during the period of study occurred from 1991 to 1996. This was not linked to an event in the energy system, but to political changes brought about by

the end of apartheid, which cast the legitimacy of apartheid state institutions and policies into doubt. The main features of this crisis were the collapse of the 'security' rationale, which had been fundamental to apartheid energy policy, and the fragmentation of traditional energy policy networks, which were only re-established on a new footing after the mid-1990s. The crisis evolved in several phases: in the first, apartheid-era energy institutions came under attack from the apartheid state itself as the security rationale waned: the accession of a reformist leadership in 1989 led directly to the dismantling of the nuclear weapons programme, and the concomitant end of the nuclear establishment's special relationship with the political elite. Political support and tolerance for the NEC also rapidly disappeared with the disappearance of the strategic imperative, and it was terminated in 1991, and its functions returned to the DMEA in a significantly-reduced form. In the second, the boundaries of the energy policy domain, as defined by the apartheid state, underwent significant modification as policy activities moved out of government into transitional negotiating forums from 1992 to 1995. The appointment of a non-ANC minister to the DMEA prolonged this phase, and only from 1996 on were boundaries and policy communities re-established, an ANC minister appointed, and policy-making moved from the transitional fora back into government.

Within this historical structure of crises, South African energy policy evolved in the six phases noted above. In the first and second phases, the energy policy domain was defined in terms of a coal-liquid fuels nexus based primarily on a resource-based approach, which had its institutional roots in the transformation of coal policy in the early 1970s. An energy policy community emerged in the 1970s, primarily focused on the EPC, which comprised state agencies involved in coal and liquid fuels policies as well as economic planners, but no private sector participants, who were limited to involvement in sectoral policy communities where their influence was substantial. In other words, energy policy in the 1970s involved collaboration between policy domains, rather than the establishment of a new one, or a 'weak' implementation of a paradigm 1 energy policy. Integration of the energy sector was thus partial, and based on a limited subset of the energy sector as a whole defined in terms of its strategic relationship to liquid fuels supplies, and significant political and institutional barriers existed to further integration. Energy policy capacity was very limited, and energy planning activities were limited to using econometric models to forecast demand on a linear basis.

The energy policy paradigm was defined through a combination of different factors. First, the country's political leadership saw energy policy in narrow terms primarily related to oil and coal: typically, electricity problems (such as the policy crises in the 1970s and 1980s) were not regarded as 'energy policy crises': thus, political support was primarily directed at achieving an overall strategic solution to the oil embargo. Second, political pressure, which was necessary to

achieve a certain degree of agency co-ordination and integration, only extended to these goals; as a result, individual supply sectors were largely able to maintain their autonomy, and in the case of electricity and the nuclear establishment, maintain it almost completely. Third, existing institutional limitations, such as the lack of any existing electricity policy capacity outside Escom, the weakness of the ECB, and the secrecy of the nuclear establishment, posed further barriers to integration and the flow of information. As a result, support for the development of comprehensive energy policy institutions was weak, and although the small energy policy bureaucracy which was established did undertake (via its network of research institutes) some ground-breaking work, it had no political relevance. Energy policies were firmly paradigm 1 policies, and demand-side policies were not considered. Typical policy solutions involved massive investments in energy supply mega-projects such as the new coal mines, the Sasol plants, and the fuel cycle plants.

In the third phase, a higher degree of integration was attained through the creation of the DMEA, but only of coal and liquid fuels-related policy and regulatory institutions. In the latter half of the 1980s, after the De Villiers Commission, electricity policy was brought further under state control through a process of institutional restructuring, but not integrated into the state's energy bureaucracy, except, as in the 1970s, in terms of coal. By the mid-1980s, the limits of the development of the apartheid state's energy policy paradigm had been achieved, with the complete integration of the oil security strategy (after the privatisation of Sasol) in the restructured CEF and the DMEA. A more ambitious project for the further integration and co-ordination of the entire energy supply sector, the NEC, was not successful. Thus, apartheid-era energy policy was confined to the development of a limited form of paradigm 1 energy policy, based on resource development, and thus focused institutionally and in terms of policy activity on primary energy supply.

The NEC did, however, create space for the development of a different set of perspectives based on energy demand, through a large-scale programme of research funding. A host of political and institutional factors led to the failure of this initiative; although researchers began to explore (and fund) paradigm 2-type energy policies, institutional and political limitations rendered these initiatives ineffectual. The one fruitful strand of research funding, supporting research on energy poverty issues, created one of the strangest organisational partnerships of the apartheid era between researchers broadly aligned with the anti-apartheid movement and an apartheid state agency, and provided the institutional context for the development of the group of ANC-aligned 'energy policy activists' which played a central role in the transitional period.

The political transition led to the collapse of the apartheid energy paradigm with the removal of the strategic imperative. The site where the energy policy community had been institutionalised,

the NEC, was dismantled in 1991 and replaced for a short time by an 'advisory' structure, but this fell into disuse within a year. At the same time, regulation of the coal market was finally abolished, and the synthetic fuels programme was halted, with no further prospect of further synthetic fuels projects after Mossgas. The nuclear establishment also lost its special relationship with the political elite. Within the DMEA, energy planning, which had (at least symbolically) been one of the main activities for co-ordinating the supply sectors, ceased, and was only continued in the late 1990s. The energy policy community thus dissolved, and its key actors focused instead on policy activity within their individual supply sectors. These policy communities collapsed during the transition into issue networks, where access was relatively open, and there was no consensus on a general policy framework or on appropriate types of state intervention; the DMEA's role was further weakened, and institutional reform was high on the policy agenda. One of the striking features of the early transition, from 1992 to 1995, was the formation of an energy policy issue network: stakeholders invested considerable resources participating in this issue network due to uncertainty concerning the nature of post-apartheid energy policy, and its influence on other policy domains. A central role was played by the group of ANC-aligned energy policy activists, who, informed by energy poverty research, and influenced by other energy policy theorists in developing countries, advocated a comprehensive approach focused on integrated energy planning, which would require significant institutional reforms. The core of this approach was a paradigm 2-type demand-focused approach to energy policy, with many elements of a paradigm 3 approach (particularly in relation to environmental externalities and energy poverty), and elements of the approach which coincided with the critique of apartheid-era energy policy and institutions espoused by the broad anti-apartheid movement in the process of taking power, were supported. While these proposals were on the agenda, and while the individual supply sector policy networks were weakened, stakeholders from these networks saw energy policy deliberations as a means to gain more certainty and influence in their own policy domains. Major energy sector stakeholders participated in 'Grand energy policy' deliberations such as the 1995 Energy Policy Summit for two reasons: first, they wished to protect their own domains and gain certainty about future policy developments, and second, they wished to build relationships with the new political elite. However, interest in 'grand energy policy' waned rapidly after the reformation of energy supply sector policy communities beginning in 1996, since both these aims could be achieved elsewhere, and the threat of a programme of major institutional reform in the energy policy system was receding.

These elements referred to above comprised a policy framework outlined in the 1998 Energy Policy White Paper, on which there was a fragile consensus. However, it was superseded by the post-apartheid energy paradigm, which developed gradually from 1996 to 2002; its emergence

was based on two processes. First, policy communities in the important supply sectors (electricity and liquid fuels) were reformed in a process beginning with the transitional negotiating fora, and ending in the late 1990s when the new state had clarified its own industrial and economic development goals. Second, there was a process of 'regularisation', which consisted of the formalisation of apartheid-era regulatory systems (primarily in liquid fuels) and their location in the state, coupled with the establishment of new independent regulatory agencies, and the development of new policy capacity in the DME in the energy supply sectors. The primary aim of the post-apartheid state in this regard was to establish a degree of 'infrastructural power' in regard to the energy sector. Although recognised both in the White Paper and in Ministerial pronouncements as significant, demand-side policies were not given prominence in the new institutional structure of the DME or its associate institutions. The key demand-side concern of the transition, household energy, was sidelined by the success of the electrification programme. Thus, although the White Paper espouses a paradigm 2 approach to energy policy, the post-apartheid energy policy is again a variant of paradigm 1, based not on primary resources (which did not feature in 1990s energy policy debates) but on the energy supply industries (electricity, coal and nuclear); however, the post-apartheid energy bureaucracy has had limited success in integrating energy sector planning processes into a general energy policy framework. The structure of the new energy policy paradigm is again defined and limited by a) the state's relationship with individual supply sectors, and b) a weak and politically unsupported energy policy and planning function[45]. The two central issues of the post-apartheid energy bureaucracy are service delivery to poor households, which is mainly pursued in the energy realm through electrification, and control of the energy sector (including state-owned enterprises and various state agencies). The use of the term 'control' here does not mean direct control (nationalisation[46]), but bringing the energy sector into the circle of influence of the new political elite, echoing similar preoccupations of the new government across the economy due to the conditions of the political transition: a (probably temporary) division between the political and economic elite of the country, and consequently political and economic power. The two main avenues through which this control is being pursued are a) the development of new elite

[45] The DME did in fact produce an impressive and detailed Integrated Energy Plan (Department of Minerals and Energy 2003), the production of which was outsourced to the Energy Research Institute (now merged with the EDRC into the Energy Research Centre), which developed significant expertise in energy modelling in the late 1990s. However, the capacity to make use of the Plan and its associated models within the DME is limited, and more importantly, the institutional arrangements for making key energy policy decisions (for instance, expansion of the electricity system) in the context of the energy planning process do not exist.

[46] It is in any case a fallacy that state-owned industries are more subject to state control.

networks through a range of measures including the promotion of leadership change[47], and b) a programme of institutional reform, which mainly consists of the establishment of independent regulators and the ending of informal regulatory practices which characterised apartheid, both of which are designed to strengthen the influence of the state *vis a vis* the energy sector. These are all goals related to specific energy supply sectors, and there are thus no strong political or economic pressures to develop energy policy measures *per se*. Thus, post-apartheid energy policy is negotiated primarily within the individual supply sector communities, and it is debatable whether there is any meaningful interaction between stakeholders in the two key supply sector policy communities (liquid fuels and electricity). This is reflected in the structure of the energy section of the DME, which is headed by two Deputy-Directors General, one overseeing electricity and nuclear power, and the other overseeing liquid fuels and energy planning. The latter forms the effective core of the energy section, since the DME's role in liquid fuels policy and regulation is decisive, whereas apart from the electrification programme, the DME has been unable to gain significant influence in electricity policy-making.

[47] Black economic empowerment and affirmative action policies are formally designed to redress the previous exclusion of black South Africans from the higher echelons of the private sector and the state, but one of its effects is to promote integration between the economic and political elite, since the black economic and professional elite are generally well-connected (and sometimes identical with) the new political elite. The post-apartheid leadership is *not* however defined in terms of race: a number of prominent senior politicians and bureaucrats with strong affiliations to the ANC are 'white'.

Chapter 8

Conclusion

Having reviewed in detail the five areas of policy and institutional development above, the study will be concluded below by a discussion of the insights into the above material provided by the three theoretical frameworks outlined in Chapter 1, followed by a brief discussion of the main research questions outlined in Chapter 1 which have not been addressed either in the text above, or in the discussion which follows.

The first theoretical framework considered was the policy networks framework, with particular emphasis on the formation and perpetuation of a specific type of policy network, policy communities. This approach proved effective in explaining the development of policy in individual supply sectors: in all four areas of policy discussed above, policymaking could be shown to have taken place in a policy community: participation was extremely limited, policy issues were resolved within the community, and policy paradigms could be identified which delineated acceptable problems and alternatives. In addition, major policy change was correlated with changes in the policy community. The process of policy community formation was consistent with the requirement of the state to increase its 'infrastructural power': however, there were some unusual contexts in which this occurred, since in three out of the four areas reviewed, some or all of the major stakeholders were themselves state agencies, some of which actually carried out policymaking outside of the orthodox government departments which performed this task within the Westminster-type bureaucracy of the pre-1994 era in South Africa. In these cases, resource exchanges were more complex, and overlaid by jurisdictional conflicts, which were waged inside as well as outside the policy community; however, the same processes took place. Jurisdictional conflicts were in many instances contained by the policy community, and policy was an outcome of a negotiation process to resolve jurisdictional conflicts. An example of this was the jurisdictional dispute between Escom and the nuclear establishment in the 1960s, which was resolved through Escom's announcement of a limited nuclear programme. Thus, the function of policy communities was often to negotiate jurisdiction within the state, to assert boundaries, and to preserve autonomy, which was a significant reason for agencies to participate in such communities, and contributed significantly to policy outcomes.

The development of energy policy itself in the early 1970s required a more complex analysis which posed several central tasks: 1) to determine whether there was an energy policy community; 2) to identify the energy policy domain; and 3) to explain the relationship between the energy policy community and other existing policy communities related to the areas discussed above. So far as point one is concerned, the conclusion reached in Chapter 7 was that there was indeed an energy policy community, from the point at which the EPC was established (1974) until the beginning of the transition, where a number of factors, almost all of which were triggered by the removal of the security imperative, caused its dissolution, and decision-making reverted to the individual supply sector policy communities. During the transition, an issue network was established, but this faded away as new supply sector policy communities emerged in the second half of the transition. These communities dominated energy policy decision-making after the transition, and overall co-ordination of energy policy per se was weak, for reasons which will be discussed further below.

The second and third points, the identification of the scope of the energy policy domain and the interaction between the energy policy community and other energy supply sector communities, was undertaken in Chapters 3 to 7 by examining three factors in the energy policy system: 1) the pattern of decision-making in individual supply sectors and in the energy policy bureaucracy after its establishment in 1972; 2) the conceptual basis for the existing energy policy paradigm; and 3) the actors involved in key decisions. The apartheid era will be discussed first, followed by the transition and the post-apartheid era. In terms of decision-making, the central feature of apartheid-era energy policy was the coal-liquid fuels nexus, and the two successful (in terms of the policy goals of the apartheid state) programmes of that era were focused on these areas. Other areas of energy-related policy were not well-integrated into energy policy decision-making processes, or not integrated at all. Underlying this pattern of decision-making was a conceptual framework which defined energy policy in terms of primary energy/natural resources, and particularly the exploitation of South African natural resources. Structuring this decision-making pattern was a set of institutions inaugurated in the early 1970s, of which the two most significant were the EPC and the Department of Planning's energy section. The composition of the EPC did not match the decision-making pattern of the EPC: decisions regarded as the prerogative of the EPC excluded areas of policy such as the liquid fuels market, the electricity market and any decision-making pertaining to nuclear policy, although the Department of Commerce and the AEB were represented at the highest level. The same pattern emerged in the 1980s in both the EPC and the NEC. This is a very important distinction, since it differentiates between the

effective[48] energy policy domain itself, and the range of actors involved in delineating that domain; thus, the nuclear establishment was prominently represented in all important energy policy fora in the 1970s and 1980s, even though nuclear policy and energy policy were arrived at largely outside the energy policy domain. The disjuncture between the results of these different ways of assessing the scope of the energy policy domain has important implications: it implies that the delineation of the energy policy domain occurred within the energy policy community, rather than prior to its existence, or elsewhere (the executive). The question then arises as to why actors whose policy domains were not integrated into the energy policy domain were participants in the energy policy community, and in its most institutionalised forms such as the EPC and the NEC, and the answer can be explored through the most anomalous member of both bodies, the nuclear establishment, the head of which was not only a member of the NEC, but its Vice-Chairman, even though the nuclear establishment had no intention of further integrating itself into energy policy decision-making processes. The composition of these fora (formally decided by the relevant Minister) was the result of two factors: 1) an understanding of the scope of 'energy policy' in the Cabinet, informed by the energy and planning bureaucracy, and 2) political pressures, which included influence of powerful state agencies with elite connections such as the AEB and Escom. In terms of these two factors, the 'energy policy credentials' of state agencies were assessed. The AEB itself had two reasons to participate in the energy policy community: first, it wished to enhance its legitimacy as an *energy* agency, and the provenance of a major energy supply option for the country (exclusion would significantly damage its legitimacy), and second, it wished to defend its high degree of autonomy against encroachment by an energy bureaucracy which received increasing support from the state until 1991 (the nuclear establishment's role in the NEC, potentially the most influential period in the energy bureaucracy's history, was also the most elevated). Ironically, the nuclear establishment's participation was also strongly supported by energy policy advocates, who emphasised the importance of its integration.

Another important factor in the 1970s and 1980s was the involvement or non-involvement of the private sector, which controlled a significant proportion of the energy economy. Until 1982, there were no private sector representatives on the EPC, which, as noted in Chapter 7, was indicative of a curious feature of the 1970s energy policy community: it was confined to state agencies, and co-ordination with the private sector was brought about in individual energy supply sector policy communities (for instance coal). After the privatisation of Sasol, a small number of private sector representatives were incorporated into the EPC, but Sasol was the only

[48] This term is used to indicate the energy policy domain as defined by energy policy decision-making, rather than its potential scope, as defined by the existing energy policy paradigm: while the paradigm might include the integration of policymaking for supply sectors, the effective domain would include only those areas where this has actually occurred.

significant energy stakeholder. This pattern was replicated in the NEC, the apartheid state's model institution for involvement of the private sector: stakeholder representation took place primarily not in the NEC itself, but in a set of subsidiary 'advisory committees' in each sector (except nuclear), consisting of producer and consumer representatives. The actors involved in the inner core of the NEC (those represented on the NEC itself) formed part of an 'inner core' of state energy sector institutions which were constant members of the energy policy community in the 1970s and 1980s, and a few others (Sasol, which had remained very influential, a few representatives from the Afrikaner business establishment, and, significantly, Anglo American), and were defined by their relationship to the apartheid-era political elite rather than their significance as stakeholders (the oil industry, for instance, was not directly represented). Thus, one of the main functions of the energy policy community in the 1970s and 1980s was to negotiate the relationship between energy sector supply policy communities: to what extent policymaking would be integrated into an energy policy framework, how this would take place, and to what extent decision-making autonomy (and resource allocation) would be maintained or undermined. Linked to this was the negotiation of the effective scope of the energy policy domain. The extent of this co-operation or autonomy was related to the overarching political imperative which drove the inauguration of the energy policy project in the first place: the security imperative created by the oil embargo. Because this political imperative arose *politically* rather than as a *structural feature of the South African energy system*, its continued existence was primarily dependent on political factors rather than economic or technological factors[49], and thus its disappearance was brought about by political change[50]. In addition, the pressure to co-operate exercised by the state was limited to strategic aspects of energy policy: coal and liquid fuels. The extent of co-operation and integration was also heavily influenced by developments within individual supply sector policy communities: the new coal policy paradigm, which formed the basis for 1970s energy policy, was eagerly supported by the coal industry and other state agencies, which resulted in the sidelining of the existing state policy agency, the Department of Commerce.

This basic model, whereby the energy policy community comprised a space for negotiating a) the effective energy policy domain, and b) the co-ordination and integration of different energy supply sector policy communities, underpinned by a political imperative which compelled specific types of co-operation, can be applied to understand the delineation of the policy domain

[49] It is arguable that the 1973 oil crisis was created largely by political factors (the Arab-Israeli war, and behind that the long-term support for Israel by the West), but the main effect of the crisis was due to structural features in non-oil producing economies, which led to a significant impetus for a new generation of energy policies. Correspondingly, in the late 1980s, when the price of oil dropped, political support for energy efficiency programmes was undermined. For South Africa, on the other hand, the real price of oil in the 1980s depended on how easily the embargo could be bypassed, and the end of the embargo meant that oil supply or use ceased to be a policy problem.

[50] The effect on energy policy of the structure of the South African energy system will be discussed further below.

and the development and interaction of policy communities during and after the transition as well. As outlined in Chapter 7, energy policy processes unfolded in three phases after 1992. In the first phase, during the first part of the transition, individual supply sector policy communities dissolved into issue networks, and an energy policy issue network was formed, structured around debates on which form post-apartheid energy policy and its associated institutions should take. EDRC policy activists were able to play a key role in these processes both as brokers and as 'grand energy policy' advocates, and mediated successfully between the new political elite and the traditional stakeholders, as well as advocating 'grand energy policy' reforms, which were supported to a certain extent by the new political elite because of the perceived closeness of the apartheid-era energy establishment to the apartheid state, as well as the requirement for access to, and control of, energy policy institutions. Traditional stakeholders were also willing to support these initiatives while their relationships with the new government were being developed.

However, in the second phase, from 1995 to 1998, individual supply sector policy communities were re-established in the context of the post-apartheid government, support was withdrawn from 'grand energy policy' initiatives, and the EDRC policy activists were sidelined. As a result, the energy policy issue network collapsed. In the third phase, from 1998 to the present, the individual supply sector policy communities were fully established, and, lacking a strong imperative, co-operation between them is weak (and almost entirely conducted through the DME). Thus, despite the White Paper, integrated energy policy activity is minimal, and energy policy is primarily conducted through individual supply sector policy communities. Thus, there is no post-apartheid energy policy community which can be identified in terms of the criteria outlined in Chapter 1: common interest in, for instance, electricity and liquid fuels usually originates in another policy domain such as industrial policy. There is another significant factor, which consists of the benefits for individual supply sector policy communities being associated with the energy policy domain: in the case of electricity, Eskom prefers the policy context of industrial policy, since this context is more sympathetic to its basic ethos (cheap electricity for national development), and is the source of resistance to the restructuring process, whereas the liquid fuels companies prefer their status as 'energy companies', since it helps to legitimate their remaining 'special status', and does not subject them to the scrutiny which is directed at other industries by bodies such as the Competition Tribunal. The energy policy framework developed in the White Paper, which largely originated with the EDRC policy activists in the energy policy issue network in the mid-1990s, forms an important basis for policymaking within individual

supply sector policy communities, but has not yet been an impetus for the development of significant energy policy institutions[51].

The relationship between energy policy networks and individual supply sector policy networks in South Africa has been outlined above: the remaining questions which this approach poses concern energy policy paradigms: how did this relationship promote or constrain the definition and development of energy policy paradigms? From the above analyses, we can conclude that two processes were important in this respect. First, in the energy policy community, the range of policy alternatives likely to be successful was largely constrained by the policy paradigms within individual supply sector policy communities (which developed their own sets of acceptable policy alternatives and solutions): thus, within the broad parameters of the type of energy policy paradigm, the specific nature of the energy policy paradigm was significantly influenced by individual supply sector policy communities. Second, in terms of the question of a change between energy policy paradigm type, in the case considered above, significant shifts in the two most important individual supply sector policy communities (liquid fuels and coal) were necessary to bring about the a shift from paradigm 0 to paradigm 1. As predicted by the policy networks framework, these shifts came from outside the existing policy communities. Other than this, the only other paradigm change that took place was from the apartheid-era energy policy paradigm (type 1) to a post-apartheid energy policy paradigm (type 1). Paradigm 2 initiatives were ultimately contained in the existing policy and institutional framework: two examples mentioned in the case material will illustrate this.

The first is energy efficiency, generally a paradigm 2 measure. Despite repeated support for energy efficiency from Commissions of Inquiry and energy policy bureaucrats, no successful programmes were implemented. Liquid fuels conservation measures, applied between 1973 and 1985, were 'managed' very carefully with the liquid fuels industry, and used only as a short-term mitigation measure: other measures were not explored. Pressure for electricity efficiency arose in the late 1970s and the mid-1980s. On the first occasion, Escom's non-participation resulted in the scrapping of the initiative, and on the second, under pressure from the De Villiers Commission, a committee (DMEA, Escom and others) handed back responsibility for developing a programme to Escom, who confined the programme to demand-side management measures until they had extra capacity in the early 1990s, when the programme was abandoned; in other words, an energy efficiency programme (paradigm 2) was reduced to an energy conservation programme (paradigm 1), with the same short-term mitigation goals as the fuel conservation programme. The second case is energy poverty, which came forcefully onto the

[51] An exception to this is the Integrated Energy Plan, which was a direct outcome of the White Paper, but as noted in Chapter 7, the impact of the planning process on policy development is so far minimal.

policy agenda during the transition. What was advocated at the time was an integrated approach to energy poverty problems, and the development of a mix of strategies (paradigm 2 or even 3). The result was a large and very successful electrification programme (paradigm 1): the limitation of the response to this programme was partly because of the success of the programme (which was measured in number of connections rather than actual mitigation of energy poverty problems), partly because of the lack of similar enthusiasm for energy poverty problems from other supply sectors, and partly because of institutional limitations. These cases illustrate how the existing structure of interests within a specific energy policy paradigm mitigate against the development and actualisation of policies from higher-level paradigms, but the explanation can be fruitfully augmented by the other two theoretical perspectives, which compensate for some of the weaknesses of the networks approach, the most notable one being a more detailed understanding of the impact of political pressure on policy processes, and the process of elaboration and dissemination of ideas.

The remaining question, posed in Chapter 2, concerns the influence of the MEC and the industrial policy elite on the development of energy policy. In the above Chapters, there was no evidence presented that the industrial policy elite opposed policies such as energy efficiency or other paradigm 2 policies; however, what was striking was the involvement of this elite in every individual supply sector policy community, and in fact, its overall influence in the individual supply sectors was greater than that of the state's energy bureaucracies, which competed for influence within the individual supply sector policy communities. This is well-illustrated by the 1983 electricity policy crisis, which energy policy advocates in the DMEA hoped to make use of to further the integration of electricity policy into energy policy processes: however, the underlying issue was the autonomy of Eskom from the industrial policy elite, and the aim of the government in establishing the inquiry was to undermine this autonomy, in the process of which the energy bureaucracy was marginalised again in respect of electricity policy. The most significant impacts which the industrial policy elite had on energy policy was through a) providing influential political support for large paradigm 1 projects, such as the coal programme and Sasol projects of the 1970s and early 1980s, b) promoting energy-intensive industrial projects from the 1960s to the 1990s, and c) providing sophisticated co-ordination for these developments within the state, and between the state and the private sector, which epitomised MEC-type industrialisation. The effect of this was that energy policy programmes promoted by the energy bureaucracy (which was relatively weak within the state) which coincided with MEC-type policies, were backed by a powerful and influential ally, whereas those which did not, such as paradigm 2 energy efficiency policies, were not. While paradigm 1 policies harmonised almost completely with industrial policy, policies which were aimed at addressing the basic

structure of the South African energy system (paradigm 2 policies such as energy efficiency), would have contradicted it. Thus, in addition to the factors indicated above, behind the energy policy successes of the 1970s was an older and more highly-co-ordinated policy complex, which was more enduringly successful in integrating the individual supply sector policy communities into a broad policy framework (with the qualified exception of the nuclear establishment) than the energy policy advocates were, which also explains why the conservation and efficiency emphases of both the Petrick and De Villiers Commissions were abandoned so swiftly by the state.

The second of the theoretical frameworks discussed, Kingdon's 'multiple streams' framework, was useful in two respects. The first was through the notion of 'policy windows' and the notion of 'focusing events', which has been discussed extensively in the case material: various policy crises played a very significant role in the development of energy policy, and Kingdon's framework provided a more detailed account of what actually happens when changes outside policy communities lead to changes in the community and paradigm change, where the new configurations come from, and why specific configurations are successful. Four key crises, in the early 1970s, two oil crises in 1973 and 1979 respectively, and a 'mini oil crisis' in 1985, all motivated institutional change in energy policy-related institutions as a result of energy policy advocates successfully making use of the resulting 'policy windows' to promote the elevation of energy policy functions in government. A fifth crisis, the political transition, led to major disruption in patterns of interaction in energy policymaking processes, which were only re-established at the end of the transition; in this process, energy policy advocates were ultimately marginalised. Another set of policy crises in the electricity sector in 1977 and 1983, did not lead to significant changes in energy policy. The first crisis was framed in electricity policy terms exclusively, and although the second was framed in energy policy terms by the De Villiers Commission, energy policy advocates were not able to achieve their goal of greater co-ordination and integration of electricity policy activity into an energy policy framework.

Another type of 'policy window', which had not been discussed in the above chapters in detail, but was very influential in setting patterns for decision-making, was created by the 'investment cycle' in individual supply sectors, which created opportunities for decision-making on a long-term cyclical basis, and set the background for the policy environment in the energy sector in an import respect. For instance, in the coal industry there was a wave of investment in the 1970s and 1980s as an outcome of a series of policy decisions made in the early 1970s: as a result, decision-making opportunities concerning coal production, and its broader energy policy contexts, were curtailed. Escom's investment decisions in the 1970s had a similar but more pronounced effect on the electricity sector, where decisions on capacity expansion or

replacement (including opportunities to develop other energy sources for electricity production) were deferred until 2005. Similar cycles featured in the liquid fuels sector. The 'policy windows' in these cycles formed important decision-nodes, not only within specific sectors, but also in terms of *energy policy generally*, since opportunities arose at these points between different energy policy strategies and approaches (for instance, rapid expansion of electricity supply, or modest expansion coupled with an energy efficiency strategy), and thus formed a structure for more general energy policy windows as well. Institutional development was also affected, since commitment at a specific decision-node to a particular energy policy strategy affected the importance specific institutions were accorded, and the way in which these would be resourced, possibly for a period of decades, which thus also contributed to the entrenchment of specific policy paradigms.

The second, which has been discussed less in the text, is the concept of 'streams', and in particular, the 'policy stream' in which policy alternatives are developed and promoted, subject to limitations imposed by a 'community of specialists'. The case material indicated that this did in fact point to a very important phenomenon in the development of energy policy in South Africa, which was easily overlooked by a network approach on account of its *historical continuity* between different energy policy paradigms and governments. From the formation of the Energy Utilisation Unit (later the Energy Research Institute) at UCT in 1973, the government energy bureaucracy has been surrounded by a group of intellectuals, primarily based in research centres, which it has consistently used to extend its energy policy capacity. In succession, after the ERI, the Institute for Energy Studies was formed at RAU in 1975, the Institute for Futures Research played a role in the NEC era, and the EDRC was formed from ERI researchers in 1989. After declining involvement in the early 1990s, the ERI began to play a very significant role again in the late 1990s, and merged with the EDRC to form the Energy Research Centre in 2002. Analysts in these research organisations (and some others) constituted a 'community of specialists', which did two things. First, it provided a skills base for energy policy-specific analysis which was not available in government, and thus provided much of the conceptual basis for energy policy activity. Second, members of the community were consistently advocates of energy policy *per se*, of integrated processes of energy policymaking. The parameters for policy alternatives in the community changed with the general political environment, but members of the community remained advocates of integration and co-ordination between different supply sector policy processes, and for paradigm 2 and 3 policies, and consistently extended the 'conceptual frontier' and the 'potential policy alternatives frontier' (indicated in Figure 2.3), and to a certain extent the 'information frontier'. The significance of this process for policymaking generally depended on another related group of officials who also had a consistent presence in

the energy policy environment, beginning in the late 1960s. The group was identified by its adherence to the energy policy project, or the integration of energy-related policy processes and institutions, and included officials from the Department of Planning instrumental in establishing and promoting an energy policy approach, including Van Rensburg, Kotzé, Neethling, Venter, Basson and others. These officials, together with the 'community of specialists', comprised what Sabatier referred to as an 'advocacy coalition'; they were referred to in Chapter 7 as 'energy policy advocates'. The relationship between the officials and the analysts was mutually beneficial: the officials supported the analysts through contract work, which also increased their prestige and influence in the energy sector (since they now formed part of the state's energy policy machinery), and the analysts provided the officials with the conceptual frameworks which they required to legitimate the energy policy function in government. This exchange characterised the whole history of energy policy in South Africa: even during the transition, the main contribution which the EDRC made to the Green and White Papers (aside from brokering the process itself, without which it might not have taken place) was a conceptual one – the development of a conceptual framework around which a political consensus could be built, which the DMEA was not capable of at the time. This was not merely a political task, but an *energy policy* task.

Given the development of energy policy outlined above, the position of this advocacy coalition was very weak throughout the history of the development of energy policy, for two reasons. First, except during times of policy crisis, the energy policy project was not strongly supported by the political elite, which had very limited goals in this respect (energy security during apartheid, control and service delivery afterwards), and secondly, and partly because of this, dedicated energy institutions in government were almost always weak and under-resourced. The only exception was the early transition, where EDRC policy activists, who were strong energy policy advocates, were influential for a period, but marginalised by the end of the transition, and energy policy activities *per se* (such as integrated energy planning) were not enhanced or entrenched. The perpetually weak position of the energy policy advocates is illustrated by another aspect of Kingdon's framework, namely problem definition: the advocates consistently failed to entrench energy policy-related indicators as significant problem indicators, with the exception of coal reserves at the beginning of the 1970s, and (secret) oil import statistics during the late 1970s and 1980s. Other than these, energy policy-related indicators (such as energy intensity) were not regarded as significant. This applies equally to the post-apartheid era, in which time the only significant indicator has been the rate of electrification. This trend was obviously enforced by the lack of information collection and processing system throughout the period considered. The existence of this advocacy coalition also explains the unusual partnership

during the last years of apartheid between officials in the NEC and the EDRC (not without conflict), which was clearly aligned with the anti-apartheid movement, and strongly suggests that there are other kinds of relationships and alliances within the energy policy milieu not encompassed by policy networks theories. One final feature of this advocacy coalition, which has been referred to briefly above, was a significant rise in influence during policy crises, at times during which the central questions for the political elite(s) (and for many stakeholders) involved not how to achieve certain goals, but how to respond to the crisis: in other words, a retreat from strategic interaction to collective problem-solving (obviously within a broader strategic context), for which the energy policy advocates were well-equipped (and therefore in demand), both to provide potential solutions, and to elaborate on the *meaning* of the crisis in policy terms. However, as crises receded, goals were clarified and strategic interaction recommenced, and the energy policy advocates were marginalised.

The third theoretical framework discussed in Chapter 1, the theory of institutions and organisations, provides further insights not forthcoming from the other two approaches, which proved significant in five areas. In the first, institutional approaches explained various constraints and opportunities for institutional reform in terms of existing institutional resources, which also constrained policy choices. As described in Chapters 3 to 7, this was useful in explaining the scope of policy choice in many situations, as well as the provenance of the specific form for institutional innovations (in which the state drew on existing institutional resources). The content of the 1970s energy policy paradigm, for instance, and the institutional form of the EPC, was influenced significantly by the existing planning institutions in the state, particularly by the form of the PAC. In the same way, the conception of energy policy as energy planning (which had a long-term effect on the culture within the energy bureaucracy, which will be further discussed below) had a similar provenance. Other institutional antecedents for later reforms included the Minerals Bureau, which was an institutional antecedent for both the DMEA's Energy Branch and for the NEC, and which itself was modelled on elements of the state's planning bureaucracy. Equally, a long-term view of the development of institutional resources as outlined by Skocpol & Finegold and March & Olsen (see Chapter 1) helped to explain the failure of many energy policy initiatives. These include Mossgas and the synthetic fuels programme of the 1980s, which, unlike Sasol, required the development of new capacities and institutions (from CEF to the project managers), the NEC, and many of the paradigm 2 measures which were attempted at various times, including energy efficiency. One of the reasons why these were not successful, apart from pressures from individual supply sector policy communities, was the lack of existing institutional resources. Lack of institutional resources also helps to explain other puzzling phenomena such as the persistence of a nuclear policy 'vacuum'

in the 1990s, and the slowness of the state's reaction to the continuation of the local fuel manufacturing process after 1993: the state simply lacked the institutions to deal with the conflict between Eskom and the AEC, which was an outcome of the way in which nuclear policy had been made and implemented for the decades before that.

Another institutional aspect of policy which shed light on a number of phenomena in the case material was the time period which is required to develop new institutions: thus the scale of institutional instability and change in the energy policy bureaucracy militated against the development of a significant organisational capacity in energy planning and co-ordination. By comparison, a successful programme such as the coal programme during the 1970s was built on existing institutional and organisation capacity: the coal industry had already developed centralised institutions for negotiating coal contracts and promoting technological development in the industry; the IDC and the railways were already involved in developing the necessary infrastructure, and the whole project was co-ordinated by a planning bureaucracy which had undertaken similar projects for decades; lastly, the development of the required information collecting and processing procedures (on coal reserves and production) occurred during the five years of the Petrick Commission, and was then institutionalised in the Minerals Bureau. In the case of energy planning, however, there was no existing skills base and no institutions for collating and processing the appropriate information. Further barriers were erected against the development of these institutions by individual supply sectors and by secrecy legislation.

The second area concerns institutional and organisational culture: differences between the different organisational cultures of state agencies, and the differences between the institutional cultures of researchers and bureaucrats illuminated various aspects of the development of the energy bureaucracy in the 1980s and 1990s, and some of the reasons for the marginalisation of the energy bureaucracy discussed in Chapter 7. Another application of the concept of organisational culture was the development of organisational goals and values, which in many instances comprised a more sophisticated explanation of organisational behaviour than an instrumental-rational explanation: an example of this is the explanation of Escom's behaviour in the 1970s, which is most successfully explained by reference to changes within the organisation from the 1950s to the early 1970s, during which a specific hierarchy of goals developed (security of supply) which was at odds with the hierarchies of other state agencies traditionally supportive of Escom (see Chapter 2).

The third area comprises the relationship between experts and policymakers, which was subject to various institutional limitations, and which provides a further context for the weak position of the energy policy advocates over the last four decades. In addition to the policy networks explanation, an institutional explanation is useful in understanding the marginalisation of the

EDRC from the energy policy environment, and the resurgence of the ERI, which poses a political conundrum: ideologically, the EDRC was extremely close to the ANC, and EDRC policy activists negotiated on its behalf with Eskom in the mid-1990s, whereas the ERI had close ties with the apartheid-era energy bureaucracy and energy sector. However, the EDRC policy activists played an advocacy role during the transition, and they thus constituted political actors themselves. During the early part of the transition, their advocacy fulfilled a valuable role for the ANC, but by the end of the transition, the ANC had assumed control of the government, and had developed its own policy agenda which was not entirely synonymous with the EDRC's. The ERI, on the other hand, in addition to providing skills required by the DME (energy modelling), had a traditionally more technocratic approach to policy, and did not develop public adherence to policy positions themselves. Thus, even given the EDRC's political affinity with the ANC, they were 'untrustworthy' experts, whereas the ERI were 'trustworthy' experts; in March & Olsen's terms, the EDRC was not "politically irrelevant".

The fourth area comprises an explanation for a curious phenomenon which has not been discussed above: the persistence of the description of 'energy planning' as *the* central activity of the apartheid-era energy bureaucracy, which was anomalous because, as documented in Chapter 7, very limited energy planning in fact took place. In the post-apartheid era, energy planning was promoted during the transition by the EDRC energy policy activists, included in the White Paper, and resuscitated practically in 2000, an Integrated Energy Plan being published by the DME in 2003. However, energy planning has not informed policy processes. This raises the question as to why it persisted. There are two institutional explanations for this. The first is the provenance of the energy policy function in the planning bureaucracy, which is related to the second, more promising explanation. Friedmann, in a detailed study of national planning in Venezuela in the 1960s, set out to explain the success and considerable legitimacy of economic planning, despite its lack of significant impact; its direct significance to national economic development was "..only of minor importance" (Friedmann 1965:48-9). Friedmann's challenge was to explain "the rising prestige of national planning in Venezuela" given this doubtful record. The key was to examine the "..latent functions of planning", consisting of "..positive contributions of planning to the social system other than those which may be subsumed under the concept of rationality" (Friedmann 1965:9). These were many: the most significant ones here were the depoliticisation of inter-agency conflicts (by subsuming them in a planning process), the depoliticisation of new policy initiatives, and the legitimation of the construction of information networks. In a similar vein, energy policy measures, which involved potentially significant inter-agency conflict, could be given a technocratic veneer through placing them in a planning context. In other words, it functioned as a way of legitimating the energy policy project,

and avoiding potentially fatal inter-agency confrontations. Thus, the apartheid-era energy bureaucracy was pervaded by a technocratic culture, and lacked *policy* analysis skills, which were also lacking in the research centres which formed the DMEA/NEC's skills base; only the EDRC actually did *policy* analysis, as opposed to what the IEA called 'energy analysis' (Interview with J Basson).

The final area concerns a distinction made by both new institutionalists and Kingdon, between defining the problem agenda, and setting out specific policy alternatives: whereas stakeholders were dominant in the first process, the second was dominated by 'communities of specialists'. This insight is useful in understanding the functioning of unusual policy communities such as the nuclear policy community, and explaining the co-existence of its dominance in policymaking and its inability to determine its broader policy context. Since it was the sole source of policy alternatives (after the 1950s), and had a virtual monopoly on 'specialists', it could dominate the policy alternatives agenda completely, but the scope of policies was circumscribed by its relationship with other state agencies and the executive, over which it had far less control, which was further curtailed on account of the secrecy surrounding the programme, which protected its policymaking function, but inhibited its ability to build broad coalitions. The same conditions applied to the electricity sector, where Escom had what was virtually a monopoly on specifying policy alternatives (even in the wake of the De Villiers Commission), but needed to build networks with other state agencies to maintain control of the problem agenda. Where the agenda did not exist (for instance, in electrification in the late 1980s), it could make policy at will. This insight augments the account of these policy communities, and provides a far more convincing insight into the operation of policy communities consisting of state agencies with overlapping institutional roles. Another useful aspect of the differentiation between problem and policy agendas is that it helps to explain policy failures, not in terms of strategic interaction, but in terms of a lack of capacity of policy agencies, which was exacerbated under apartheid for various reasons.

Thus, the policy networks approach, which formed the basis for the study, was augmented by the other two approaches in several important ways, which provide explanations for phenomena not addressed by the former approach. Finally, two questions which were posed in Chapter 1, and were not addressed fully in the main study or above, will be discussed briefly below. These are:

- The continuities and discontinuities between apartheid energy policy and post-apartheid energy policy.
- The relationship between energy policy and the structure of the South African energy system.

Although the details of the first question have been thoroughly addressed above, some of the broader trends bear examination. A general approach to the question is provided by Gunther (1996) in a study of the transition to democracy in Spain in the 1970s; he noted "dramatic changes in both policy processes and outputs" (Gunther 1996:157), whereby policy processes were dramatically expanded in their scope (more stakeholders incorporated), and more complex and sophisticated policy outputs emerged, successfully integrating a far greater range of social and political demands (Gunther 1996:158-9). There were some significant differences between the Franco regime and apartheid, which primarily revolve around the existence of democratic institutions, and the kinds of political pressures which are expressed through these institutions. It is a subject of constant debate as to what kind of regime the apartheid regime was (proposals range from 'limited democracy' to 'totalitarian'), but the important fact here was that certain forms of (albeit severely limited) democratic institutions did exist, which did lead to the representation of a limited range of interests, and limited institutions for consultation in policy processes.

The apartheid civil service was however characterised by an authoritarian culture which discouraged any form of dissent (political or organisational), and also by informal regulatory and governance procedures via elite networks, and there are enough parallels for Gunther's analysis to be useful. Thus, there were indeed significant changes of the kind Gunther describes as a result of the end of apartheid: the direct result of the introduction of the post-apartheid political system was to introduce a much broader representation of interests in all levels of the political system, and also to introduce a range of processes and institutions lacking under apartheid, including strong and independent competition authorities, better and more transparent public finance management, and more open and consultative policy processes. These developments immediately put pressure on a number of apartheid-era practices in the energy policy domain, and the scope of policy processes was broadened, which paid immediate dividends in the form of electrification, many new and independent institutions were developed, and policy and regulatory processes were formalised and made transparent, which was also a feature of the transition in Spain (Gunther 1996:163). The security imperative was removed with the transition, and strategic programmes were dismantled. Ironically, however, the removal of the security imperatives also removed the main impetus for energy policy per se, and current energy policy does not have a strong overall rationale. In the early part of the current decade, what has begun to emerge are two weak rationales: 1) an 'infrastructure industry' rationale across the energy sector, and 2) a social development rationale, which has been strongly advocated by the Cabinet, but less comprehensively implemented by the DME. There are also signs of interactions in the energy system growing more complex: natural gas is now available in Gauteng via pipeline from

Mozambique, and Eskom announced a tender for several large-scale liquid fuels-fired open cycle peaking plants for the western Cape. This, and the high oil price, has begun to give a structural impetus to point 1).

Aside from the institutional and political changes, there are a surprising number of continuities in policy frameworks in different sectors, the details of which have been outlined in Chapters 3 to 7. Aside from these, the structure of the energy system itself plays a significant role. This is the subject matter of question 2. It has been observed in Chapter 2 that the structure of the South African energy system (its overwhelming dependence on coal, and the use of liquid fuels primarily for transport, for which there is no current substitute) resulted in a lack of development of energy policy institutions in the 1950s and 1960s, when these developed elsewhere, mainly on account of the encroachment of oil. The same lack of complexity in the South African energy system has remained, apart from the encroachment of coal into the liquid fuels domain, which has increased the country's dependence on coal. Since there are no structural imperatives to develop a strong basis for energy policy, the same limits to developing paradigm 2 and 3 energy policies will remain, which will limit the state's ability to respond adequately to policy challenges such as climate change and energy poverty, unless it is addressed proactively through the creation of new and well-resourced institutions backed by significant and consistent political support.

Thus, in conclusion, using these three theoretical approaches was very fruitful in uncovering different aspects of the development of a specific policy milieu, which supports the contentions of Allison and Zelikow (1999) and Sabatier (1999). The application of the model proposed in Chapter 2 was also very illuminating, and the development of South Africa energy policy was consistent with the model, given the nature and development of the South African energy system. It thus appears that the model is a useful framework for understanding the emergence of energy policy, as well as its succession from one type of paradigm to another. There was also a high degree of correlation between the actual development of South African energy policy and the institutional limitations on paradigm type predicted by the model: however, more comparative research would have to be undertaken to demonstrate the model's wider applicability.

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Most media references were to the *Financial Mail*, a weekly publication aimed at the business community, since it contained the most consistent (and in many cases, only) reporting on energy policy-related developments. It served two purposes: first, as a source of information, which was extremely valuable given the otherwise patchy written record of these developments; and second, as a reflection of the outlook of its target readership, which comprised the (during apartheid, 'white') business establishment, and constituted an important part of the status quo in the apartheid era, although frequently critical of the state's more 'pedantic' or 'excessive' apartheid policies. Daily newspapers quoted were the *Cape Times* and the *Argus*, based in Cape Town, and the *Natal Mercury*, based in Durban, and the only other news publication referred to was *The Executive*, a short-lived monthly publication aimed at senior business executives in the 1990s.

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Department of Mines Annual Reports 1935-1979
Department of Planning Annual Reports 1964-1979
Electricity Supply Commission (Escom) / Eskom Annual Reports 1923-2002
National Energy Council Annual Reports 1987-1992

Note: Department of Planning and National Energy Council annual reports cover irregular periods, or periods of a year not beginning in January. References in the text are to the year of publication: thus, Department of Planning Annual Report 1967/1968 is referred to in the text as (Department of Planning Annual Report 1968). There is some debate as to whether Escom/Eskom is/was a 'government' organisation, but since its annual reports were tabled in parliament, these have been listed here.

times higher, were an incentive to concentrate on the export trade to the detriment of the domestic market. This meant in practice that there was a degree of cross-subsidisation between the export and domestic markets. As the Commission noted,

> "..a further difficulty may present itself in the near future due to the possibility of some colliery companies concentrating on the shipment market only.." (1946-47 Coal Commission:130),

thus undermining the cross-subsidy process, and disadvantaging collieries which produced for the local market at what was effectively a subsidised price. Thus, the Commission recommended that

> "..in the event of collieries concentrating on the export market only whilst inland prices are controlled, action should be taken to regulate coal supplies for shipment purposes.." (1946-47 Coal Commission:130).

This recommendation the government accepted, and began using its powers to control coal exports from 1950 as a way of compelling coal companies to produce for the inland market (Financial Mail 21/12/1973). Exports of coking coal were generally prevented. Coal exports also suffered from severe transport bottlenecks, often leaving export orders unfilled (Lang 1995:133), and undermining South Africa's reputation as a reliable supplier. Transport bottlenecks also frequently resulted in domestic shortages, both for direct users and for power plants, which resulted in a 1951 Commission of Inquiry (1951 Coal Shortages Commission) to examine ways in which future supply problems could be resolved. A combination of these factors and the global substitution of oil for coal in the post-war decades led to a stagnation in the export trade until the early 1970s.

Price Regulation and the Domestic and Export Markets

Because of the factors mentioned above, the regulated coal price in the 1950s and 1960s was extremely low. In addition, government sought to encourage industrial development through cheap inputs, and the Price Controller in particular saw price control as a way to combat inflation (Financial Mail 15/12/1967), which became the dominant framework for considering price increase requests from industry in the 1960s. The low domestic price of coal was regulated according to a succession of rate-of-return formulae which were calculated without taking into account sufficiently the impact of inflation (Financial Mail 27/11/1970). Price increases were granted on an ad-hoc basis by the Price Controller, based in the Department of Commerce and Industry. While this system was tolerable to industry during the 1950s, inflation, which had averaged 2% in the 1950s and 4% in the 1960s, began to erode profit margins significantly in the late 1960s, and particularly from the early 1970s on, when there was a massive increase in inflation (which averaged 12-15% during the 1970s). A combination of stagnating domestic

thus to facilitate a "fair return" on behalf of investors (Lang 1995:57); in other words, to control the coal market.

Following this, a range of other cartels were formed on a similar basis, including several associations in Natal (of which the Natal Associated Collieries (NAC) was the most enduring and influential), the Anthracite Producers' Association (1962) and the Coke Producers Ltd (1925). The TCOA represented the vast majority of coal-mining activity in the country, and its involvement in policy-making, regulation and general interaction with the state was the most significant; it, along with the NAC, was represented on almost every influential advisory or statutory body which had a bearing on the coal industry, since the state regarded these bodies as representative of the coal industry as a whole.

Collieries competed for long-term contracts with large customers such as Escom, but almost all other coal on the domestic or export markets was sold through the TCOA until the 1970s. Amongst its other roles, the TCOA also co-ordinated production between collieries for large export contracts, such as the early export contracts with Japan in the 1970s. Non-TCOA members were admitted to the cartel after they had demonstrated that they possessed significant market power, which was the case with the bloc of collieries owned by emerging 'Afrikaner capital'[35] in the 1950s; these were, as with the other collieries at the time, incorporated into an 'Afrikaner capital' gold-mining consortium. The gold-mining context was somewhat unusual, since the cartel was not successful in charging monopoly rents for coal, which was in fact underpriced for large periods of its existence. Christie (Christie 1984:41) suggests that gold-mining interests undermined the cartel by owning collieries inside and outside it. This might have been the case up to the 1920s, but the industry was almost completely owned by gold mining houses after that; thus, a more persuasive explanation lies in the amelioration of risk by the gold mining establishment. Two of the key risks for the mining establishment, in an environment where the geology of gold reserves required deeper and deeper mines[36], was the possibility of spiralling energy costs, or even volatile energy markets, and competition for cheap labour. The function of the cartels in controlling the market was not to earn monopoly rents, but to prevent non-gold market participants from extracting rents, and from competing for labour (and thus increasing wages). The coal industry was mainly viewed by the gold industry (who

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[35] A central policy of the National Party government (in power from 1948 to 1994), which was strongly Afrikaner nationalist, was to challenge the 'English' economic hegemony: in 1948, not only was the economy almost entirely owned by English-speaking South Africans, but there was a significant difference in income levels between English-speaking and Afrikaans-speaking white South Africans (O'Meara 1996:74). The government sought to remedy this by promoting Afrikaner ownership of the economy, and particularly the mining industry, traditionally dominated by English-speaking South Africans with strong imperial connections.

[36] Deep-level mines (from 500m to several kilometres) pose unique problems which usually require energy-intensive solutions, both for construction (shaft-sinking), transport, and most importantly, air conditioning, without which it is impossible to work at those depths, in addition to other more routine energy-intensive problems of hard-rock mining. This type of mining is also labour-intensive, and the South African model of deep-level mining was built on ultra-cheap labour.

very little differentiation of product and little beneficiation. Inflation in the 1960s, without concomitant price increases, meant that capital investment was at very low levels, and most production came from old mines. Expansion in the coal market was limited to new long-term contracts with Escom[33], the state electricity utility, which were usually negotiated at significantly below the regulated wholesale price.

The third phase, from the 1970s to the present, was a watershed for the coal industry. The change in policy engendered by the Petrick Report lead to significant real increases in the regulated domestic price, and an emphasis on increased extraction and utilization rates, which were conditions for the issuing of export permits. While the direct coal market remained static, the electricity industry launched a massive expansion programme during the 1970s, and a large-scale synthetic fuels industry was inaugurated from the late 1970s, which together dominated coal demand from the late 1970s onwards. An additional factor was the resurgence of the export market, which increased dramatically in the late 1970s as a result both of a resuscitation of the world coal market in the wake of the 1973 oil crisis, and a change in government policy towards exports. The key factor in reviving the export industry was the development of the Richards Bay Coal Terminal in a deep-water port north of Durban, and an associated dedicated rail link from the most important coalfields to the port, which solved the logistical problems which had bedevilled the industry before the 1970s. The link between the railway system and the coal industry was thus largely broken by the 1980s, as most coal (for electricity, synthetic fuels and export) was either consumed at the mine mouth, or transported via the dedicated rail link to Richards Bay.

Increased demand, higher regulated prices and the promise of the export market led to the transformation of the image of the industry in the eyes of investors: the coal industry of the 1960s only had a market capitalisation of R175 million, and key figures in the mining industry talked publicly about the folly of investing in it (Financial Mail 27/11/1970). By the end of the 1970s, revenue for the industry was over R2 billion, and the Financial Mail reported that

> "Coal shares are amongst the most expensive on the JSE; it's not difficult to see why.. ..the coal sector was the top performer on the JSE [in 1976/7]" (Financial Mail 22/4/1977).

Capital flowed into the industry, in time to fund a significant expansion in production capacity, including a large number of new coal mines. Coal output more than doubled between 1970 and 1980, and quadrupled by the end of the century.

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[33] The Electricity Supply Commission, the name of which was changed to Eskom (not an acronym) in the 1980s. Unlike Escom, Eskom is not an acronym, but a combination of the English and Afrikaans acronyms: Escom and Evkom. These names will be used interchangeably, but where possible, the name which matches the historical context will be used.

Commission:7). This basic methodology was revised and extended; in the 1950s, geologists estimated resources of 59 898 million tons (1952) and 63 905 million tons (1959) (1970-75 Coal Commission:7). The 1969 Coal Advisory Committee estimated 24 885 million tons of economically recoverable reserves of bituminous coal. After an exhaustive reassessment, again further developing the methodology of reserves estimation, the Petrick Commission reached a similar figure in 1975 of 24 915 million tons of economically recoverable bituminous coal, out of a total of 81 274 million tons of mineable bituminous coal resources (1970-75 Coal Commission:7). Given extraction technologies and coal prices at the time, these figures caused a policy crisis, and energy analysts suggested that the country would have to seek alternative energy sources by 1990 (see below); however, partly as a result of the success of 1970s coal policy measures, new estimates in the 1980s were 121 218 million tons, of which 51 960 million were economically recoverable (South Africa Coal Statistics 1993:4), and the 2001 estimate for economically recoverable coal was 55 333 million tons (Department of Minerals and Energy 2002a:50), which pushed back the possibility of real coal shortages to the last quarter of the 21st century.

The Development of the Coal Market

Up to the 1950s coal was mined on a relatively small scale, and was used directly[32] by the railways, mines, industries, and households, and for conversion into electricity by a largely decentralised electricity industry. Since 1950, coal use and production has been influenced primarily by four broad trends: no growth (and eventually a slow decline) in direct use of coal by consumers; a rapidly expanding coal-based electricity sector; the rapid development of the synthetic fuels industry during the 1970s; and the equally rapid development of a massive export industry from the early 1970s. These combined trends led to the doubling of coal production from its 1950 level by 1970, and an eightfold increase by 2000, illustrated by Figure 3.1 below.

The evolution of the coal market occurred in three phases. In the first phase, from the inception of the industry until the 1940s, the market consisted of consumers who used coal directly, including the railways, and a nascent electricity industry. There was a significant export trade; until the late 1940s, between $^1/_3$ and $^1/_6{}^{th}$ of the annual tonnage was exported (1946-47 Coal Commission:15-16), which dropped to around 2% between the 1950s and 1970s (Department of Mineral and Energy Affairs 1995:13). Mining was largely labour-intensive, inefficient and unsafe, with the gradual introduction of mechanisation. The state began to impose coal grading in the 1920s, but the price was set by the market, subject to the behaviour of a number of cartels

[32] 'Direct' use of coal, which is referred to often below, is the use of coal by consumers themselves (primarily in industry), as opposed to its use by industries (electricity, synthetic fuels) which convert the coal to another energy carrier which is then used by the consumer.